3.2 ROADS AND ROAD TRANSPORTATION

1) Road Network

Metro Manila's transport network is composed of a set of radial and circumferential major roads which are supplemented with secondary and tertiary roads, PNR lines, a LRT line and a limited waterway (see Figure 3.2.1).

Metro Manila's road network is relatively well-structured compared to other Asian cities. This is particularly explicit in the area within and around EDSA where most of them were completed during the first half of 1900's.

Basic major road network consists of 10 radials and 6 circumferentials. An interval between radials and an approximate radius of circumferentials are summarized in Table 3.2.1.

TABLE 3.2.1 INTERVAL BETWEEN RADIALS AND RADIUS OF CIRCUMFERENTIALS

INTERVAL BETWEEN RADIALS (KM)				RADIUS & INTERVAL OF CIRCUMFERENTIALS		
AT C-2		AT C-4			RADIUS (KM)	INTERVAL (KM)
R-1		R-1		C-1	1.8	
	0.9		0.9			1.4
R-2		R-2		C-2	3.2	
	1.0		1.7			2.3
R-3		R-3		C-3	5.5	
	0.9		3.0			3.5
R-4		R-4		C-4	9.0	
	1.9		3.1			3.5
		R-5		C-5	12.5	
			[4.8]			6.0
R-6		R-6		C-6	18.5	
	1.2		2.9			
R-7		R-7				
	0.7		[4.8]			
R-8		R-8				
	0.8		1.7			
R-9		R-9				
	[2.5]		[4.0]			
R-10		R-10				

At C-2 location, major radial roads are placed at a relatively fine interval ranging from 0.7 km to 2.5 kms. A wide interval of 2.5 km between R-9 and R-10 is supplemented by secondary major roads of Abad Santos Avenue and Juan Luna Avenue.

At C-4 location, major radial roads are located at an interval of 0.9 km. to 4.8 kms. Although an interval between R-5 and R-6, between R-7 and R-8, and between R-9 and R-10 is rather wide, one or two secondary major radials are placed in between these major radials.

Inner circumferentials are located at a fine interval ranging from 1.4 km. to 3.5 kms. and outer circumferentials' interval ranges from 3.5 km. to 6.0 kms.

Thus, Metro Manila's major road network is well formulated, however, it is yet to be completed. Following sections of radial-circumferential configuration are still incomplete or non-existent:

<u>Radial Roads</u>

- R-4: The section from C-4 to C-5 is under construction. No plan has prepared yet for the rest of sections.
- R-10: Initial Stage (25-meter portion of 50-meter ROW) of the section from C-1 to C-4 is almost completed. The section from C-4 to C-6 is non-existent.

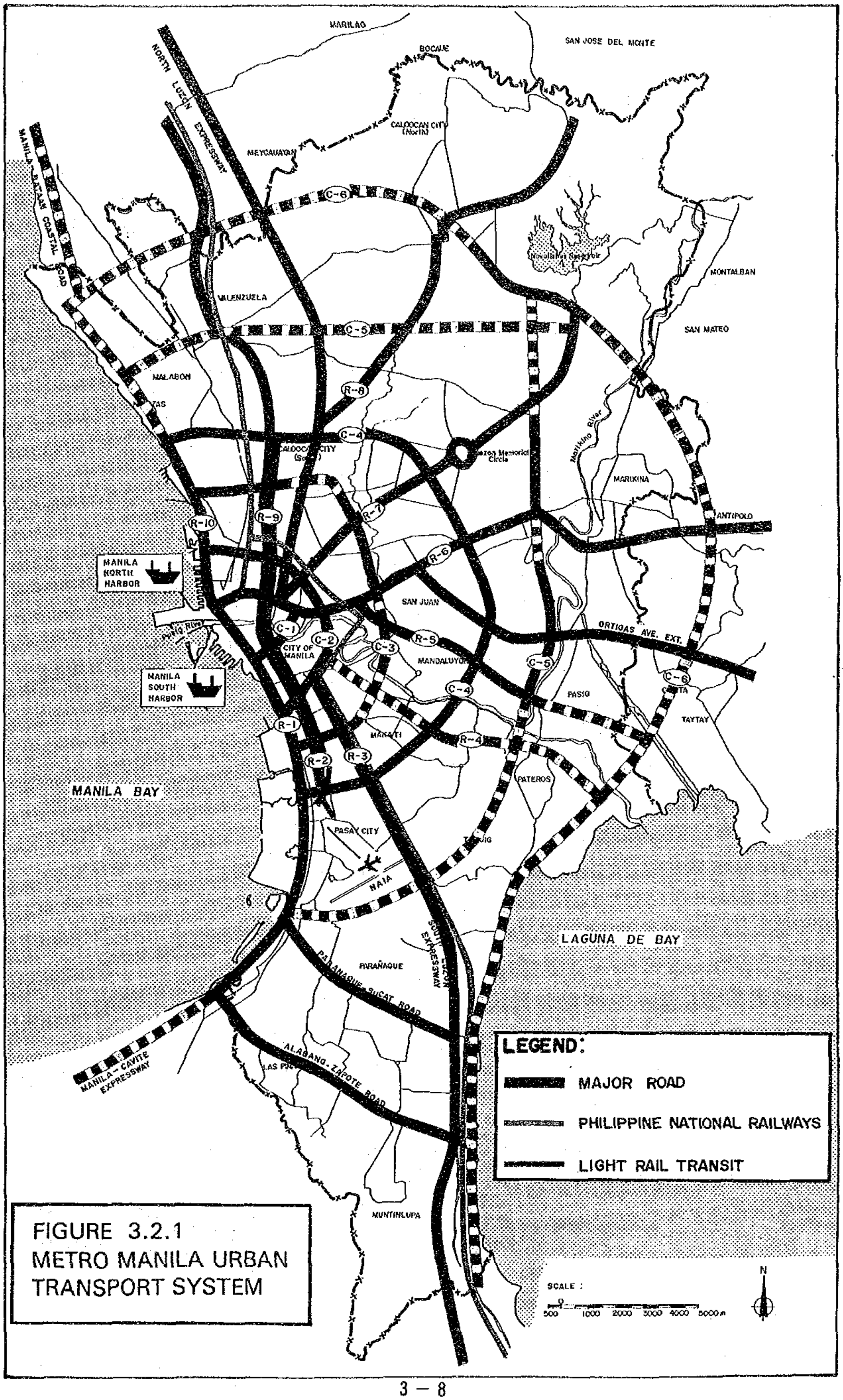


FIGURE 3.2.1
METRO MANILA URBAN
TRANSPORT SYSTEM

Circumferential Roads

- C-2: The section from Gov. Forbes Avenue to R-10 is under construction.
- C-3: The section from Araneta Avenue to A. Mabini Street is under construction. The section from Gil Puyat Avenue to San Juan Bridge is non-existent.
- C-4: Widening of the section from Rizal Avenue Extension to Dagat-Dagatan Avenue is still incomplete.
- C-5: The only section existing is from R-5 to R-7, which needs widening and improvement. The rest of the sections is still non-existent.
- C-6: Most of the sections are still non-existent.

As shown above, radials are mostly developed, however, development of circumferentials is still less than halfway to be completed.

Although these incomplete sections are under construction or in the implementation pipeline, the overall progress tends to be delayed due mainly to ROW acquisition and squatter problems. Any further delay in the completion of the at-grade major roads would adversely affect effective urban development, particularly in outer areas where suburbanization trend is significant.

At-grade roads development in the future is getting to be increasingly difficult, thus, the development of an elevated expressway system and mass-transit systems such as PNR commuter service and LRT expansion at the earliest time, is also badly needed.

2) Road Extension

Metro Manila has a total public road length of 3,091.3 kms. comprising of the following:

National Road	907.5 kms.
City Road	1,282.0 kms.
Municipal Road	583.1 kms.
Barangay Road	318.7 kms.
Total	3,091.3 kms.

In addition to public roads, there are about 1,850 kms. of private roads which are located inside housing subdivisions and several commercial complexes developed by a private sector.

Road extension in Metro Manila seems to be quite extensive as a whole, however, road development disparity by area is quite high, which is true particularly of major roads. As there is no official functional road classification yet, the Study Team roughly classified roads into major and minor roads in order to know the development level of major roads by area. Table 3.2.2 shows a density of major roads (major road length/land area) by city/municipality. The city of Manila has the highest road density of about 2.0 km/sq. km., followed by Pasay City, Mandaluyong and Makati. Whereas, Las Piñas has the lowest major road density which is only one fifth of that of City of Manila. It is obvious that a city or municipality located outside of C-4 (EDSA) has very low major road density.

TABLE 3.2.2 DENSITY OF MAJOR ROADS BY CITY/MUNICIPALITY

CITY/MUNICIPALITY	ROAD LENGTH (KM.)	LAND AREA (SQ. KM.)	ROAD DENSITY (Km/Sq.Km.)
1. Manila	77.0	38.3	2.01
2. Pasay	23.7	14.0	1.69
3. Mandaluyong	14.3	11.1	1.29
4. Makati	37.4	29.8	1.26
5. Pasig *	36.0	32.6	1.10
6. Kalookan (South)	13.5	12.8	1.05
7. San Juan	5.9	5.6	1.05
8. Pateros *	2.5	2.6	0.96
9. Quezon City	148.8	166.2	0.90
10. Paranaque *	30.8	38.3	0.80
11. Navotas	7.9	10.4	0.76
12. Malabon *	16.7	23.4	0.71
13. Taguig *	12.3	33.7	0.69
14. Kalookan (North) *	22.9	43.0	0.53
15. Marikina *	20.3	38.9	0.52
16. Valenzuela *	24.0	47.0	0.51
17. Muntinlupa *	19.4	46.7	0.42
18. Las Pinas *	15.7	41.5	0.38
Total	540.0	635.9	0.85

Source: Study Team
Note : * denotes – City/Municipality located outside of C–4

3) **Road and Road Traffic**

Traffic conditions on Metro Manila roads have been changing significantly, reflecting the progress of suburbanization and the active development of urban centers/commercial complexes along EDSA and some arteries, as well as in suburban areas. The major changes which are taking place and will continue in the future are as follows: (Refer to Figure 3.2.2).

- Traffic concentration in the inner center has become less significant. In many road sections, the traffic volume either showed an insignificant increase or even reflected a decrease since 1980.

- On the other hand, the traffic volumes along EDSA, SSH, and Quezon Avenue have increased tremendously. EDSA carries 100 thousand to 200 thousand pcu along major sections, SSH between 80 thousand and 120 thousand pcu, and Quezon Avenue between 60 thousand to 100 thousand pcu. For radial roads, traffic volumes along the sections outside EDSA have more significant increases. In view of the lack of road network, especially in the areas outside EDSA, the continuing tendency in traffic increase in these areas would further worsen the traffic situation.

- Due to the lack of road traffic capacities along radials, many of which have already reached their capacities during the 1980s, the role of circumferentials have become critical.

- From the public transport viewpoint, bus traffic is relatively concentrated along SSH (outside EDSA)/EDSA/Quezon Avenue (outside EDSA) and some sections of Roxas Boulevard and Taft Avenue only, while jeepneys can be found all over Metro Manila, sharing normally from 20 to 50% of the total traffic volume, except in sections where jeepney operations are banned or restrained.

For some of the important arteries such as EDSA, SLE/SSH, and Quezon Avenue, the traffic characteristics, in more detail, are as follows:

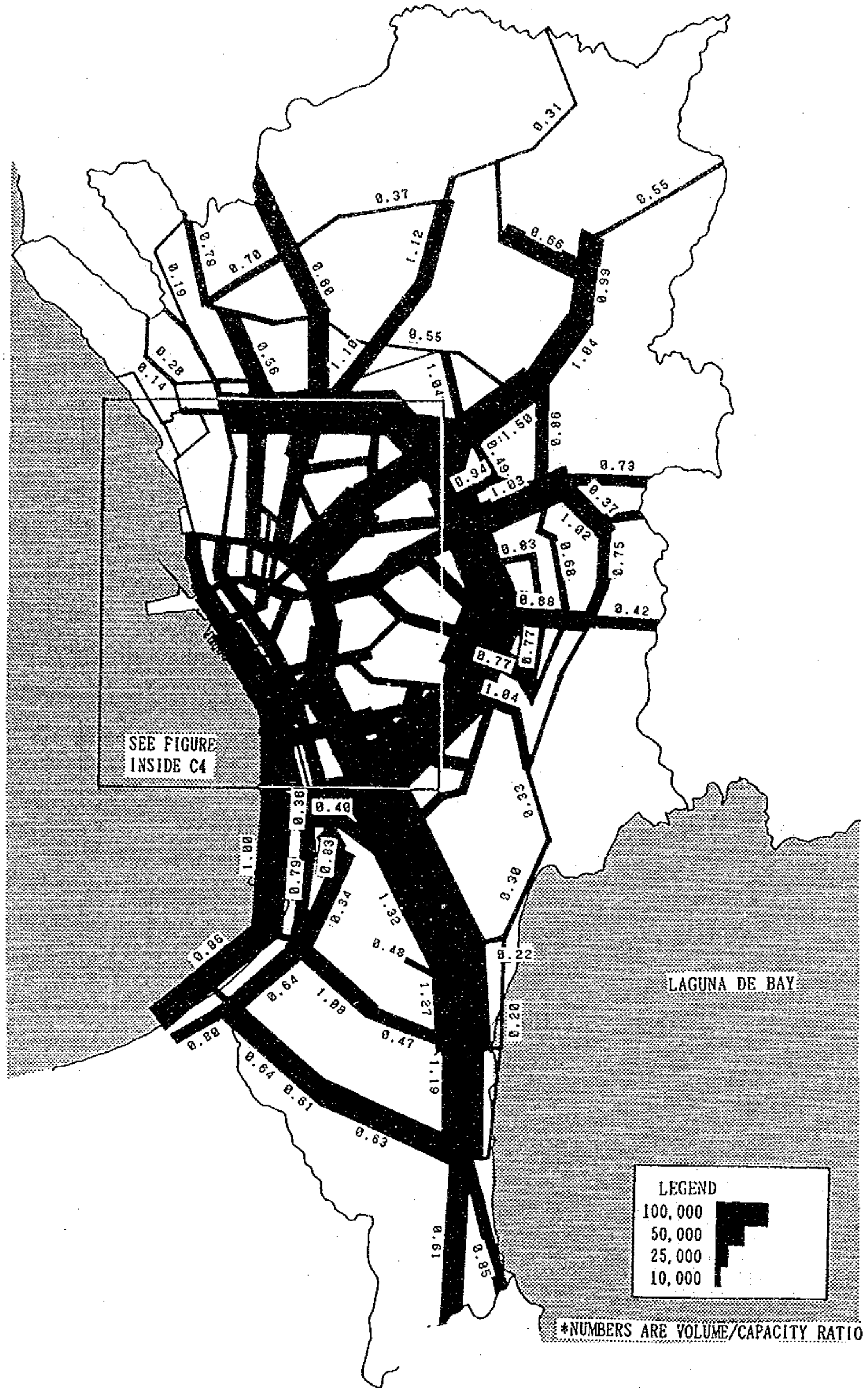
- EDSA has become the most significant private car and bus transport axis 40 to 50 years after its construction. In view of the current and anticipated tendencies of developing varied urban centers and car-owning households along SSH/EDSA/Quezon Ave. corridors, the traffic concentration along EDSA would further continue.

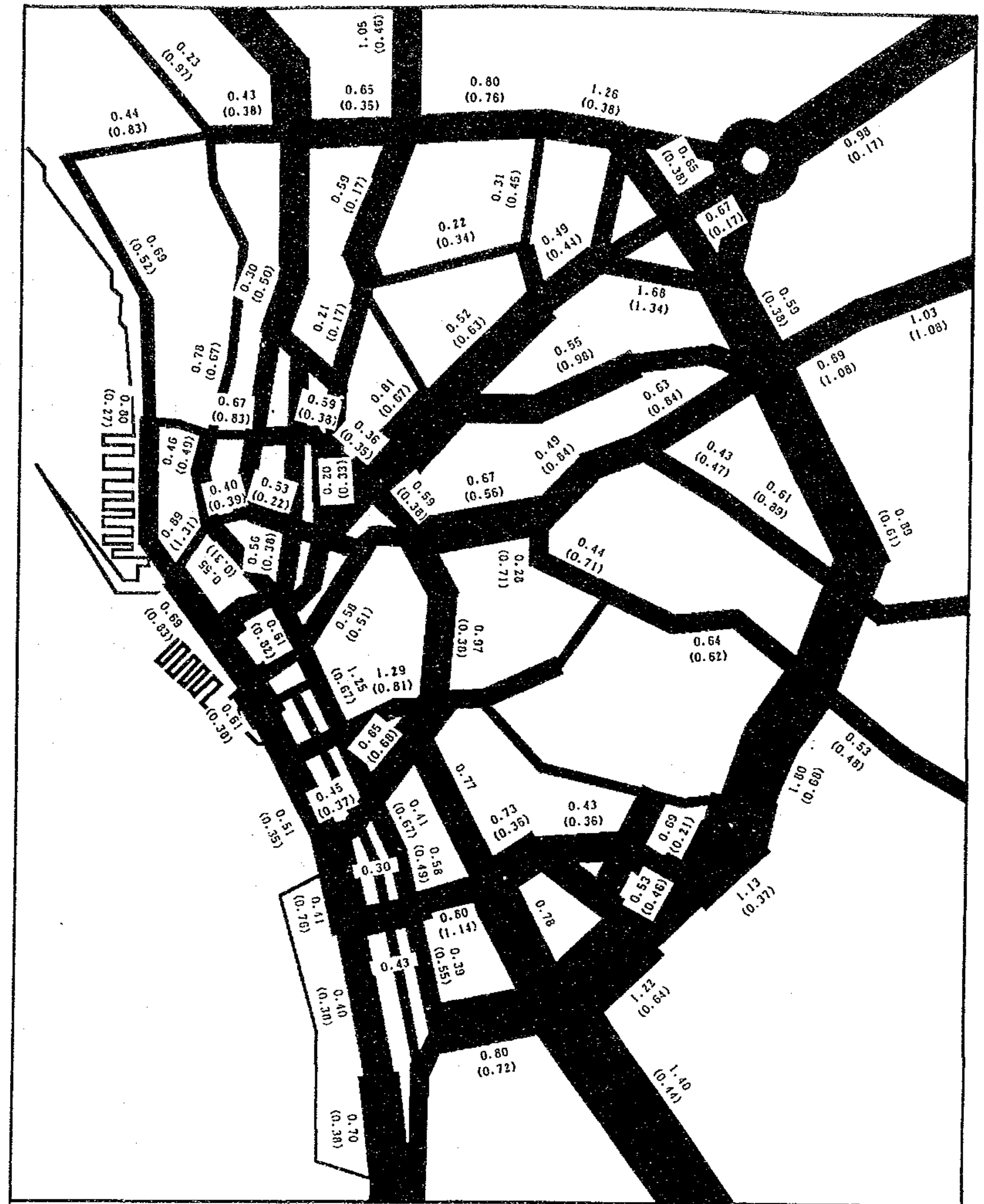
- SSH/SLE has been heavily utilized since the last several years due to the rapid suburbanization and industrial/commercial developments in the south. The section with the heaviest road traffic of more than 120,000 pcu a day is between EDSA and Bicutan. It is expected that the traffic along the roads will farther grow significantly. Although this corridor is dominated by private cars like EDSA, truck traffic sharing 4-8% is also relatively significant.

- Quezon Avenue serves the growing traffic in the northern Metro Manila carrying about 60 thousand to 100 thousand pcu. The road traffic is more mixed with private car, jeepney and bus which reflect the more mixed landuse along the road.

- Roxas Boulevard is another heavily trafficked road with high percentage of private cars. Its farther growth largely depends on the urban development along the coast especially on the existing and planned reclamation areas.

FIGURE 3.2.2 ROAD TRAFFIC VOLUME ON MAJOR ROADS





VEHICULAR TRAFFIC FLOW ON MAJOR ROADS(INSIDE C4)

REGEND 100,000
50,000
25,000
10,000
(PCU/DAY) 1.02←VOL-CAPACITY RATIO
(0.76) ; V/C Ratio

1980

SOURCE:TEC

TABLE 3.2.3 VEHICULAR TRAFFIC VOLUME ON MAJOR ROADS

CORRIDOR	ROAD SECTION	CAR	JEEPNEY	BUS	TRUCK	TOTAL (AADT)	TOTAL (PCU)	No. of LANES	CAPACITY (PCU)	V/C RATIO
C1										
	Marcos Road-J.Luna	7089	9968	438	194	17689	23524	2	26400	0.80
	J.Luna-J.A.Santos	7089	9968	438	194	17689	23524	4	58400	0.40
	J.A.Santos-Rizal Ave.	12665	12145	11	147	24968	31204	4	58400	0.53
	Rizal Ave.-ESPANA	13437	12458	12	138	26045	32430	4	58400	0.56
	ESPANA-Logarda	24071	3039	398	830	28338	31284	6	88800	0.35
	Legarda-Taft Ave.	18033	4	34	2807	20878	23738	6	88800	0.27
	Taft Ave.-Roxas Blvd.	32651	7558	123	4486	44818	53267	6	88800	0.60
C2										
	Marcos Road-J.Luna	7858	109	31	4847	12845	17793	2	26400	0.67
	J.Luna-J.A.Santos	22217	5420	370	1506	29513	34284	4	58400	0.59
	J.A.Santos-Rizal Ave.	12437	5045	23	587	18092	21236	4	58400	0.36
	Rizal Ave.-Andalucia	10588	5395	21	570	16574	19873	4	58400	0.34
	Andalucia-ESPANA	25582	3801	568	853	30804	34409	4	58400	0.59
	ESPANA-R.Magsaysay	21026	0	61	1224	22311	23626	6	88800	0.27
	R.Magsaysay-Nagtahan	47720	3465	131	16578	67894	86401	6	88800	0.97
	Nagtahan-SSH	51913	1	315	2087	54316	56876	6	88800	0.64
	Legarda-Taft Ave.	42550	0	1903	1100	45553	49507	4	58400	0.85
	Taft Ave.-Roxas Blvd.	24191	0	551	211	24953	25990	4	58400	0.45
C4										
	North Bay Blvd.-Rizal Ave.	8842	7540	1434	931	18747	25599	4	58400	0.44
	Rizal Ave.-Monumento	8045	8148	1374	803	18370	25308	4	58400	0.43
	Monumento-A.Bonifacio	26760	10540	4881	1409	43590	57590	6	88800	0.65
	A.Bonifacio-Roosevelt	47140	743	7236	2470	57589	71284	6	88800	0.80
	Roosevolt-South Ave.	51157	1532	8267	18859	79815	111840	6	88800	1.26
	South Ave.-East Ave.	67384	1088	10278	1748	80498	98207	10	150000	0.65
	East Ave.-Aurora Blvd.	57384	1098	10278	1748	70508	88222	10	150000	0.59
	Aurora Blvd.-Ortigas Ave.	78798	0	9729	1643	90170	106406	8	120000	0.89
	Ortigas Ave.-Shaw Blvd.	112686	1929	9407	38686	162708	216469	8	120000	1.80
	Shaw Blvd.-G.Puyat	98825	1925	11486	2821	115057	136069	8	120000	1.13
	G.Puyat-SSH	119671	153	7355	4048	131227	146384	8	120000	1.22
	SSH-Taft Ave.	59554	14536	4531	1880	80501	96445	8	120000	0.80
R1										
Roxas Blvd.	M.Roxas Bridge-P.Burgas	19631	3018	35	18560	41244	61365	6	88800	0.69
	P.Burgas-P.Qirino	60153	7700	343	522	68718	73604	8	120000	0.61
	P.Qirino-V.Cruz	58990	1081	276	74	60421	61449	8	120000	0.51
	V.Cruz-Buendia	55146	1450	959	545	58100	60808	10	150000	0.41
	Buendia-EDSA	52144	1217	1838	524	55723	59612	10	150000	0.40
	EDSA-MIA Road	50783	8083	7301	1368	67535	83896	8	120000	0.70
R2										
Taft Ave.	Lawton-City Hall	30409	473	1177	924	32983	35909	4	58400	0.61
	City Hall-Pedro Gil	21728	19496	8583	209	50016	72847	4	58400	1.25
	Pedro Gil-P.Quirino	18780	9731	1816	175	30502	38266	4	58400	0.66
	P.Quirino-V.Cruz	7037	10880	77	320	18314	24189	4	58400	0.41
	V.Cruz-Buendia	5054	18873	8	103	24038	33589	4	58400	0.58
	Buendia-EDSA	2925	4830	0	83	7838	10336	2	26400	0.39
R3										
SSH	Pros.Qurino-Vito Cruz	57673	0	2158	2809	62640	68686	6	88800	0.77
	Vito Cruz-Buendia Ave.	61334	1014	3821	2926	69095	78259	6	88800	0.88
	Buendia Ave.-EDSA	52013	0	2762	5192	59967	69302	6	88800	0.78
	EDSA-Bicutan	71657	19080	6193	4220	101150	124199	6	88800	1.40
	Bicutan-Sucat	57196	1419	4320	4041	66976	78206	6	88800	0.88
	Sucat-Alabang	62380	2828	5380	3802	74390	87676	6	88800	0.99
R5										
Shaw Blvd.	R.Magsaysay-Sta.Mesa	12707	6866	80	739	20392	24684	6	88800	0.28
	Sta.Mesa-P.Sanchez	16805	13169	167	838	30979	38652	6	88800	0.44
	P.Sanchez-EDSA	32482	10931	607	3049	47069	56494	6	88800	0.64
	EDSA-Outside EDSA	26831	8878	582	2520	38811	46643	6	88800	0.53
R6										
Aurora Blvd.	C2-C.M.Recto	20981	23233	741	981	45936	59645	6	88800	0.67
	V.Mapa-F.Roman	24378	11024	448	544	36394	43122	6	88800	0.49
	F.Roman-EDSA	29179	16133	657	522	46491	56065	6	88800	0.63
	EDSA-20th Ave.	22342	24520	603	523	47988	61675	6	88800	0.69
	20th Ave.-A.Bonifacio	23819	22251	772	432	47274	59989	4	58400	1.03
R7										
ESPANA Quezon Ave.	P.Paredas-Welcome Rtnd.	44954	34193	300	306	79753	97605	8	120000	0.81
	Welcome Rtnd.-South West Ave.	38209	13383	408	1301	53301	61905	8	120000	0.52
	South West Ave.-EDSA	38758	12403	288	320	51769	58722	8	120000	0.49
	EDSA-Quezon Circle	38384	4924	4093	870	48271	57742	8	120000	0.48
	Quezon Circle-A.I.T.	45531	17960	2075	1661	67227	80980	8	120000	0.67
	A.I.T.-Ipo Road	28094	15010	1535	1481	46120	57408	4	58400	0.98
R8										
A.Bonifacio	Laong Laan Blumentritt	8851	1685	11	58	10605	11522	4	58400	0.20
	Blmentrit-Del Monte	11102	255	48	387	11792	12378	4	58400	0.21
	Del Monte-EDSA	28239	8759	1078	4299	42375	52670	6	88800	0.59
North Div. Rd	EDSA-Valenzuera	42211	7410	973	2727	53321	61212	4	58400	1.05
R9										
J.A.Santos	C.M.Recto-Tayuman	23424	3133	633	1087	28277	31880	4	58400	0.55
	Tayuman-urora Ave.	18108	3731	582	730	23151	26619	4	58400	0.46
Rizal Ave. Ext.	Aurora Ave.-EDSA	16153	17424	847	433	34857	45272	4	58400	0.78
McArthur Hwy	Outside EDSA	4057	5894	0	393	10344	13684	4	58400	0.23
R10										
	Del Pan Bridge-C2 Road	17410	7529	54	8848	33841	46534	4	58400	0.80
	C2 Road-C3 Road	11515	7434	22	8717	27688	40155	4	58400	0.69
	C3 ROAD-Lapulapu	1638	383	74	1285	3380	4967	4	58400	0.09
M.Naval	Lapulapu-Estrella	1913	652	0	406	2971	3703	2	26400	0.14
	Outside EDSA	3596	6850	80	207	10733	14485	2	26400	0.55

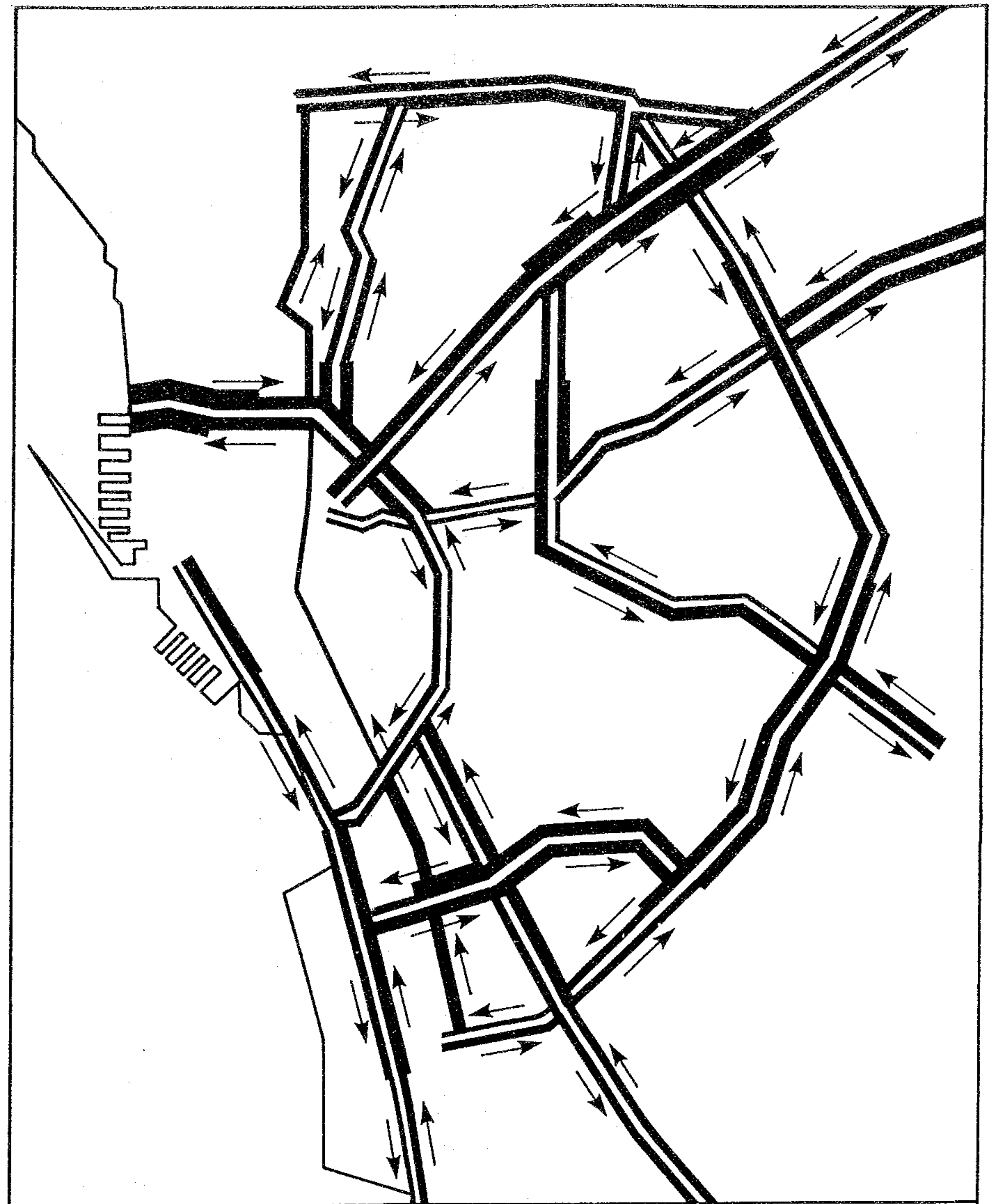


FIGURE 3.2.3
AVERAGE TRAVEL SPEED ON SELECTED MAJOR ROADS

REGEND
-10
10-20
20-30
OVER40
TRAFFIC FLOW DIRECTION
Km/hr.

In conclusion, it could be summarized that the private road traffic pattern has been shifting rapidly from the traditional radial/circumferential pattern to that of north-south axis.

4) Deficiencies in Road Network

Deficiencies in road network which are major causes of traffic congestion are summarized as follows:

a) The major road network is partially developed characterized mainly by non-homogeneity due to non-existence of some sections and inconsistency of levels of service

Of the six (6) circumferential roads proposed for major road network, C-3 and C-5 are partially completed and C-6 is non-existence, thus C-4 is heavily over-burdened. Due to incomplete development of C-3 and C-5, traffic is forced to pass on radial roads up to C-2 or C-4, thus causing traffic congestion on radial roads as well.

b) No systematic division of work network

There is no systematic division of the road network into an appropriate hierarchy of functional classes which is regarded as a useful tool in providing efficient road services and promoting effective, traffic management.

c) Under-utilization of road capacity

Road capacity is under-utilized due to poor discipline of drivers, passengers and pedestrians, curb parkings, poor channelization and signal phasing of intersections, inefficient enforcement of traffic rules and regulations, and vendors at sidewalks.

d) Deteriorated Pavement

Travellers are forced to select slower travel speed due to deteriorated pavement surface conditions which are caused by the following:

- most existing roads were originally designed and constructed to carry much less traffic than the actual
- large number of over-loaded trucks
- many existing roads have already reached their service life, making them uneconomical to maintain
- installation and improvement of underground utilities within road right-of-way
- inadequate maintenance funds and practice
- poor drainage conditions

e) Uncoordinated Development of Private Roads

Mostly, private roads were developed independent of major road network system and are open only to home owners and authorized vehicles resulting to access difficulty from one area to another. This situation is observed particularly in rapidly urbanizing areas outside C-4.

f) <u>Absolute Lack of Roads Outside EDSA</u>

In addition to the problems outlined in the above, quantities of roads lack absolutely in most of the areas outside EDSA where urban development has been in rapid progress and traffic demand in sharp increase. Because of this traffic is not properly dispersed and tends to concentrate on limited major roads, thus amplifying the congestions and environmental nuissance.

3.3 PUBLIC TRANSPORTATION

1) Metro Manila's Public Transport System

Public transportation in Metro Manila is provided with road-based modes including different types of buses, jeepneys, and tricylces, 15-km LRT Line 1 and PNR commuter service. Road-based public transport modes cover extensively the Metro Manila areas with a complement of bus, jeepney, and tricycles. Bus, jeepney, and tricycle serve respective person trips of 1825000, 6061000 and 1566000 a day, meeting 69.5% of the total urban transport demand. LRT serves the most-crowded public transport corridor, carrying about 350,000 passengers a day. Congestion-free LRT has a stable patronage and its expansion is desired. PNR commuter service, on the other hand, is handicapped by unfavorable location of the route and substandard facilities. However, continuous worsening of traffic congestions would further strengthen the justification of expansion of rail-based mass transit systems.

2) Buses and Jeepneys

On primary and secondary roads, bus and jeepney are practically the basic public transport modes which play critical role for public transport users. Generally speaking, jeepneys with an estimated fleet of approximately 50,000 units meet wider public transport demand (about 6 million trips a day or 45% of the total urban transport demand or 60% of the total public transport demand) than approximately 3,000 buses which are more concentrated on some major roads, especially EDSA.

Although bus and jeepney in Metro Manila have not been complementary but rather competitive, farther development of airconditioned bus and rapidly growing tricycles contribute to the improvement of overall public transport services.

Increasing traffic congestions in many parts of Metro Manila have been affecting buses and jeepney operations seriously. Although bus exclusive lanes are provided along EDSA, there are insufficient public transport priority measures in the rest of Metro Manila. In order for the Government not to encourage the shift to private transport patronage, there is a strong need to undertake more comprehensive policies/measures for the improvement of bus and jeepney transport services in addition to the expansion of urban railtransit.

3) Urban Rail Transit

LRT Line No. 1 constructed on an elevated system along Taft-Rizal Avenues (15.4 km) has been a successful case of developing urban mass transit in large developing urban areas. Since the opening of the system in 1985, it has been well utilized and became a reliable and well accepted public transport system in Metro Manila. It carries approximately 350,000 passengers a day which is more than the practical carrying capacity of the system.

Although the LRT is considered as an effective and efficient public transport mode and expansion of Line 1 capacity and construction of Line 2 and Line 3 have been approved, the implementation has been delayed due to large financial involvement of the Government.

Philippine National Railway has also been operating commuter services since the 1970s, using the at-grade existing tracks. The commuter section covered San Fernando, Pampanga in the north, Metro Manila and Calamba, Carmona and

College in the south during the early 1980s, while the present services are limited to the 40 km section between the Meycauyan in the north and Carmona in the South. East line in Metro Manila between Sta. Mesa and Guadalupe has also ceased operation. At present, ridership is limited to only about 10 thousand a day due to non-availability of rolling stock, deteriorating tracks and facilities, etc. Rehabilitation projects are on-going but the construction work involves a difficult problem of relocating almost 10 thousand squatter families. When the rehabilitation work is completed, the commuter service will benefit about 100,000 passengers a day.

CHAPTER 4

TRANSPORT DEMAND FORECAST

CHAPTER 4

TRANSPORT DEMAND FORECAST

4.1 OVERALL PROCEDURE

Transportation demand of Metro Manila has been estimated in the form of OD Tables for years 1990, 2000 and 2010. In consultation with the UTDP Study which was supposed to provide the OD Tables, necessary OD Tables for this Study were worked out based on the following work:

a) Preparation of 1990 OD Table by reviewing and modifying available OD Tables on the basis of the results of the Household Interview Survey (HIS) conducted by Tsukuba University/ALMEC Corporation in 1990, results of the Screenline and Cordonline Surveys conducted by UP/DOTC in 1990, and results of the supplemental survey conducted in this Study.

b) Estimate of the total trip demand in Metro Manila on the basis of the analysis of trip generation by mode and by income group for years 2000 and 2010.

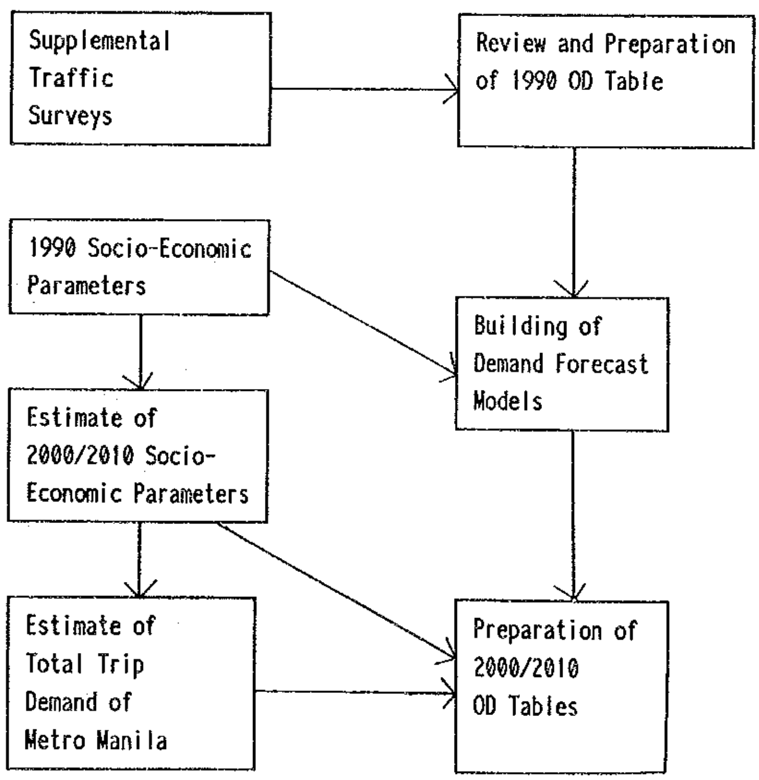
c) Building of demand forecast models on the basis of 1990 trip data and socio-economic parameters.

d) Preparation of 2000 and 2010 OD Tables.

The overall procedure is outlined as shown in Figure 4.1.1 and is explained more in detail in the following sections.

FIGURE 4.1.1

OVERALL PROCEDURE OF TRANSPORT DEMAND FORECAST



4.2 SUPPLEMENTAL TRAFFIC SURVEYS

In order to complete the data necessary for this Study, a number of traffic surveys were undertaken including cordonline surveys, traffic count surveys, travel speed surveys, and port/airport surveys which are outlined in Table 4.2.1.

TABLE 4.2.1 SUPPLEMENTAL TRAFFIC SURVEYS CONDUCTED

TYPE OF SURVEY	OBJECTIVE	METHODOLOGY	SURVEY COVERAGE/AREAS
1) Cordonline Surveys	To update the cordon-line data of 1984 and to refine the existing 1990 OD table	Roadside Interviews (Origin/Destination), Traffic Count, and Vehicle Occupancy Survey	Conducted at the same 14 stations as the previous surveys plus 1 new station all at the boundary of Metro Manila
2) Traffic Count Surveys	To determine traffic volume and characte-ristics of major roads	Manual count of vehicles by type and time on road sections	Conducted at 12 stations outside EDSA not covered by TEC and 3 stations within EDSA to supplement TEC data
3) Travel Speed Surveys	To determine travel speeds on relevant roads	Record vehicle speeds on road sections	Conducted on major roads not previously covered by the TEC surveys
4) Port/Airport Surveys	To determine the nece-ssity of linking major transport facilities with the expressways	Origin/Destination inter views, Traffic Counts and Vehicle Occupancy Counts	Conducted for North Harbor, South Harbor, MICT, Domestic Airport, NAIA, and Cargo Terminals

4.3 1990 OD TABLE

1) Methodology

The available 1990 OD table was the one estimated in JUMSUT based on the 1980/1983 HIS data. Review of the JUMSUT OD table shows, however, that the traffic generation/attraction of some areas including Makati, Quezon City, etc. is considerably underestimated. It seems traffic distribution towards suburban areas took place much faster than expected. Therefore, the 1990 OD table was prepared by making use of the results of 1990 HIS conducted by Kurokawa Laboratory of Tsukuba University and ALMEC Corporation. Methodologies undertaken are outlined as follows:

(a) Preparation of initial OD table derived from 1990 HIS.

(b) Adjustment of OD table traffic against the screenline traffic east-west along Pasig River and north-south along San Juan River and PNR.

(c) Estimate of cordonline OD traffic based on 1990/1992 cordon traffic survey results.

(d) Further adjustment of OD table traffic against additional screenlines set along radial and circumferential directions. This work is to supplement further adjustment of OD table against actual traffic volume which is deemed necessary due to the low sample rate of the 1990 HIS (at approximately 6,000 households).

2) Comparison of the 1990 HIS OD Table with the Existing OD Table

In order to understand the basic changes of traffic demand between 1980 and 1990, comparisons were made as shown in Table 4.3.1, which indicates the following:

(a) Between 1980 and 1990, strong concentration of traffic demand into Makati CBD and suburban areas including Muntinlupa, Navotas, Quezon City (outside EDSA), Kalookan North, Pasig, Taguig, Las Pinas, Pateros, and Valenzuela took place, while on the other hand, relative decline in Manila, Mandaluyong, San Juan and Quezon City (inside EDSA).

(b) JUMSUT 1990 OD table shows that the growth of Makati/Mandaluyong development and the suburbanization trend, especially in the south (Taguig, Paranaque, Muntinlupa, and Las Pinas) and in Kalookan North were underestimated.

3) Traffic Zones for Analysis

Metro Manila has been divided into 66 traffic zones while the external area of Metro Manila into 6, on the basis of JUMSUT 202 Zone System. Zoning system used in the Study is Figure 4.3.1.

TABLE 4.3.1 COMPARISON OF TRAFFIC SHARE AMONG 1980 HIS, 1990 JUMSUT AND 1990 HIS OD TABLES

	ZONE NO.	1980 HIS (A)	1990[1] JUMSUT (B)	1990[2] HIS (C)	1990 JUMSUT / 1980 HIS (B)/(A)	1990 HIS / 1980 HIS (C)/(A)	1990 HIS / 1990 JUMSUT (C)/(B)
Manila 1	1	0.067	0.056	0.043	0.839	0.640	0.763
Manila 2	2	0.087	0.070	0.059	0.807	0.673	0.834
Manila 3	3	0.109	0.087	0.064	0.798	0.590	0.739
Manila 4	4	0.093	0.079	0.068	0.845	0.725	0.858
Pasay City	5	0.039	0.036	0.039	0.925	0.999	1.080
Makati	6	0.038	0.067	0.091	1.764	2.399	1.360
Mandaluyong	7	0.039	0.032	0.040	0.808	1.025	1.268
San Juan	8	0.024	0.017	0.018	0.711	0.730	1.027
Quezon City 1	9	0.053	0.041	0.030	0.785	0.577	0.735
Quezon City 2	10	0.075	0.096	0.128	1.274	1.695	1.330
Quezon City 3	11	0.055	0.042	0.037	0.771	0.671	0.870
Quezon City 4	12	0.038	0.033	0.035	0.864	0.927	1.073
Kalookan South	13	0.062	0.065	0.047	1.059	0.757	0.715
Kalookan North	14	0.008	0.010	0.016	1.350	2.066	1.530
Valenzuela	15	0.021	0.027	0.029	1.284	1.332	1.037
Malabon	16	0.022	0.024	0.027	1.120	1.260	1.125
Navotas	17	0.015	0.020	0.015	1.369	1.010	0.738
Marikina	18	0.030	0.033	0.029	1.100	0.989	0.900
Pasig	19	0.040	0.054	0.027	1.353	1.106	0.818
Pateros	20	0.004	0.005	0.015	1.247	1.221	0.979
Taguig	21	0.014	0.018	0.025	1.1268	1.842	1.452
Paranaque	22	0.033	0.033	0.041	0.995	1.257	1.263
Muntinlupa	23	0.017	0.031	0.037	1.791	2.169	1.211
Las Pinas	24	0.018	0.023	0.033	1.282	1.836	1.432
Total Generation/ Attraction		1.000	1.000	1.000	–	–	–

1) OD Table worked out in 1983 by JUMSUT Study
2) OD Table worked out in this Study

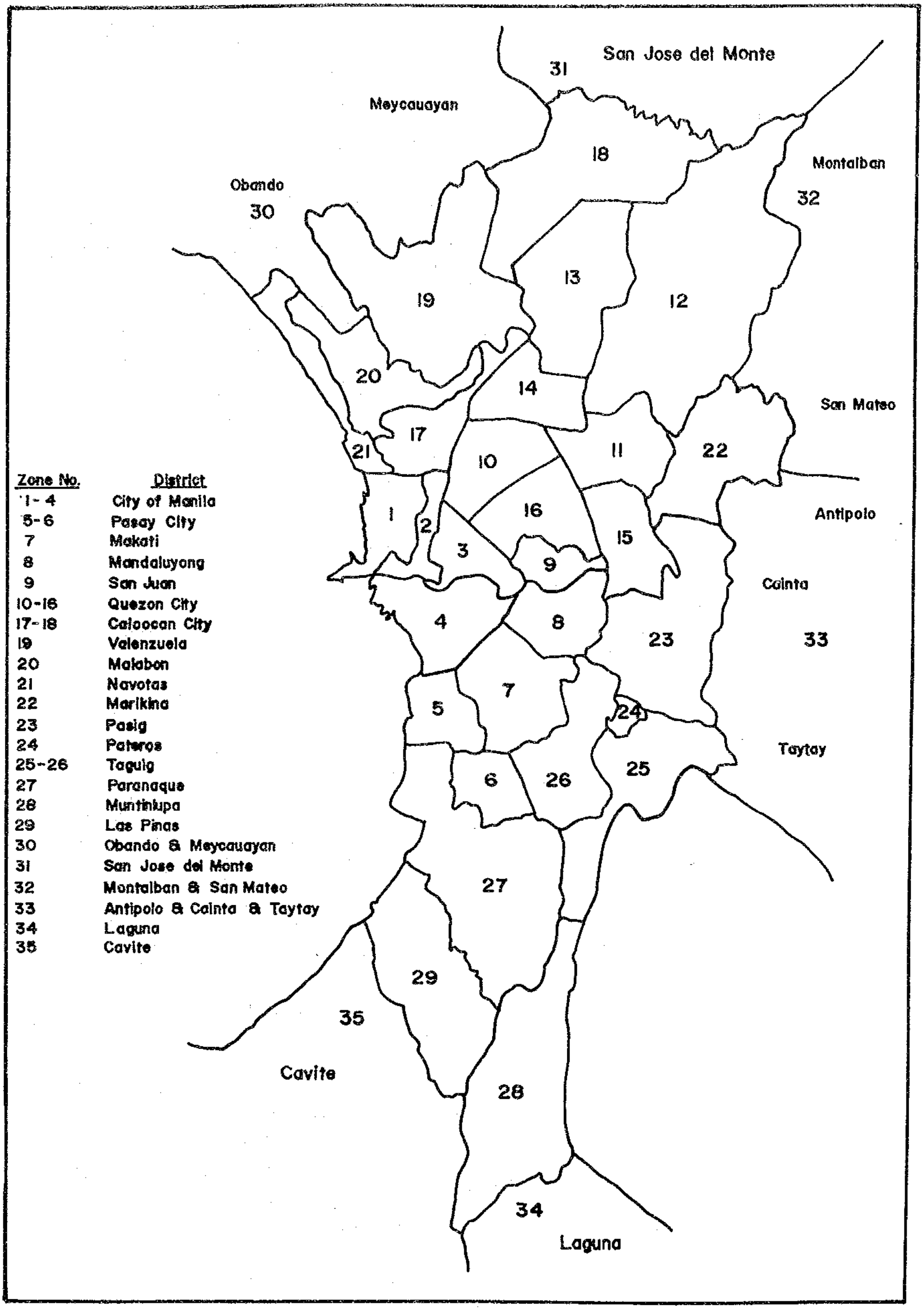


FIGURE 4.3.1 TRAFFIC ZONES FOR EXPRESSWAY STUDY

4.4 FORECAST OF SOCIO-ECONOMIC PARAMETERS

1) General

The objective of the socio-economic study is to prepare the necessary inputs for traffic demand analysis and forecast and to assess proposed expressways form an urban development viewpoint. The socio-economic study during the first three-month period was undertaken with particular regard to the following:

(a) Review of available studies, plans, and policies on urban development and planning of Metro Manila.

(b) Review of existing landuse data prepared by UTDP.

(c) Determination of methodologies to estimate the necessary socio-economic parameters for traffic analysis and projection of this Study.

2) Findings on Existing Information on Landuse

Among the available data and information, as well as studies, plans and policies on urban development and landuse reviewed by the Study Team, the following sources were studied in detail:

(a) MM's urban development framework and landuse data and plan for Metro Manila

(b) NSO statistics including their projections

(c) Landuse data prepared by UTDP

At present, there is not sufficient official information on urban development framework, existing landuse, zoning and future landuse plan/policy. Although MMA (Metro Manila Authority) consolidates the aforementioned information, the work and responsibility have been affected and reduced during the transition period from MMC to MMA. However, from the discussions with MMA officials, it is found that:

(a) Basic urban development directions stipulated in the Regional Development Framework Plan is still effective. (Refer to Figure 2.3.2)

(b) Zoning is currently being revised by municipality with MMA assistance. In the meantime, the existing future landuse could provide the basis for traffic analysis. (Refer to Figure 2.3.1)

(c) MMA has not updated the development framework for Metro Manila, with particular regard to socio-economic indices such as population, employment, school attendance, car-ownership, household income, etc.

NSO provides projection of Metro Manila's future population on three scenarios depending upon the population growth under low, medium, and high assumptions.

UTDP worked out a set of socio-economic data by traffic zone for year 1990, 2000, and 2010 based on the available data, results of supplemental survey, and various assumptions which are used as inputs to traffic demand projections or preparation of OD tables. Since the output of UTDP Study was supposed to be a major input to the expressway study, this will be discussed separately in the following section 3).

3) Review of Landuse Data Prepared by UTDP

The landuse data including future projection for Metro Manila has been worked out by UTDP which is the latest and most comprehensive. UTDP parameters include population, employment (both at residence and work place) and school attendance (both at residence and school place) for years 1990, 2000, 2010. Zonal breakdown of these parameters has also been worked out on 217 traffic zones. The forecast methodology and the results are contained in the report entitled "Socio-economic Data Sources of Base Year 1990 and Forecast Methodology (2000-2010) by UTDP."

Major findings of socio-economic data are as follows:

(a) 1990 population: UTDP uses 1990 NSO census data by municipality but further breakdown into 217 zones is patterned according to 1980 census data. Since 1990 NSO census data is available by barangay, it is possible to work out on individual zone basis;

(b) 2000/2010 population: UTDP assumes that the population concentration in the already densely populated areas such as City of Manila, Pasay City, Kalookan City, and those mostly within EDSA would remain throughout year 2010.

4) Population Forecast

With regard to the future population distribution, an alternative projection was made on the basis of the analysis of past trend, as well as population density and landuse characteristics of Metro Manila by area. Judging from that there is declining tendency of population in many zones within EDSA between 1980 and 1990 (Refer to Figure 2.2.2) and many large cities have experienced or have been experiencing the movement of people towards suburban areas for better environment or less expensive housing, it is also likely that population distribution in areas outside EDSA in Metro Manila would be more accelerated in the future. The comparison of population projections on the two scenarios are summarized in Figure 4.4.1 and Table 4.4.1. Alternative landuse scenario (Case 2) is assumed for the basis of estimating other relevant socio-economic parameters and traffic demand.

5) Forecast of Other Socio-Economic Parameters

Population is the basis of projecting other relevant socio-economic parameters. Methodologies have been determined and preliminary estimates made on employment at residence and work place and school attendance at residence and school place for Metro Manila as outlined below and the results are summarized in Table 4.4.2.

TABLE 4.4.1 POPULATION DISTRIBUTION IN METRO MANILA (1980–2010)

CASE 1: UTDP Landuse Scenario

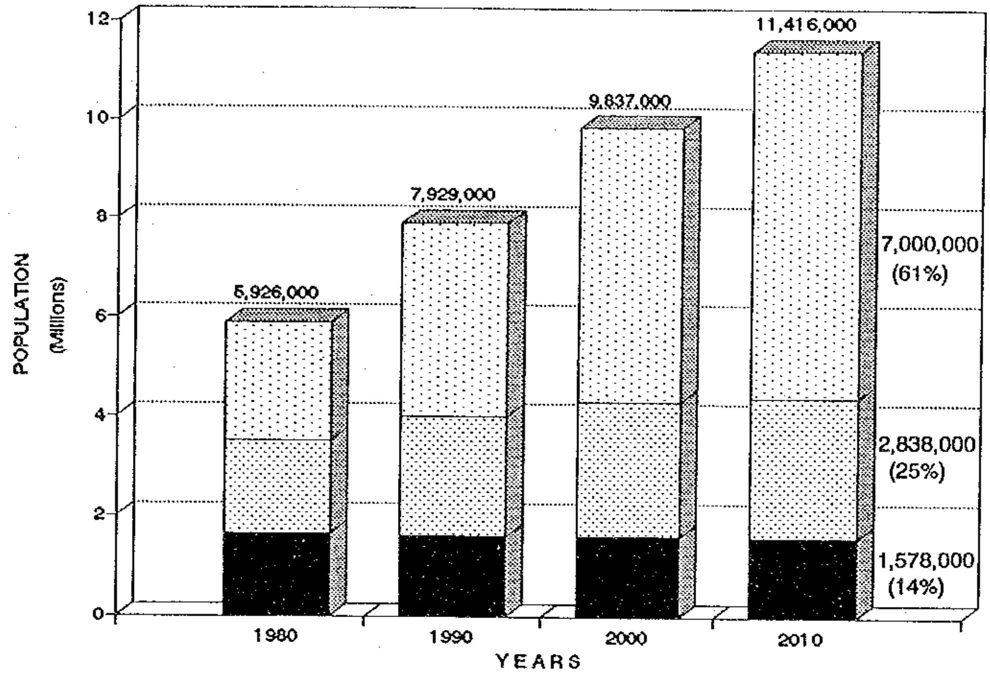
	POPULATION (X 1000)					ANNUAL GROWTH RATE (%)				AREA	POPULATION DENSITY (PERSONS/HA				
	1970	1980	1990	2000	2010	80/70	90/80	00/90	10/00	(HA.)	1970	1980	1990	2000	2010
City of Manila	1331	1630	1599	1584	1578	2.05	−0.19	−0.10	−0.04	3830.9	347	425	417	413	412
Manila 1		585	555	550	550		−0.18	−0.09	0.00	805.8		701	689	683	683
Manila 2		218	197	187	181		−1.01	−0.52	−0.33	570.5		382	345	328	317
Manila 3		428	428	428	428		0.00	0.00	0.00	935.7		457	457	457	457
Manila 4		418	419	419	419		0.02	0.00	0.00	1518.9		275	276	276	276
Pasay City	128	288	366	412	423	8.44	2.44	1.17	0.30	1397.1	92	206	262	295	302
Makati	165	373	453	502	501	8.50	1.97	1.02	0.02	2979.6	55	125	152	168	168
Mandaluyong	93	205	245	263	255	8.27	1.79	0.73	0.33	1110.3	83	185	221	237	229
San Juan	65	130	126	124	124	7.11	−0.27	−0.19	0.00	557.8	117	233	227	222	222
Quezon City	469	1166	1667	2091	2410	9.54	3.64	2.29	1.43	16616.8	28	70	100	126	145
Quezon 1		272	314	329	335		1.45	0.46	0.18	1488.9		183	211	221	225
Quezon 2		472	847	1225	1526		6.02	3.76	2.22	12256.5		39	69	100	124
Quezon 3		189	206	210	213		0.87	0.22	0.10	1339.7		141	154	157	159
Quezon 4		233	300	327	337		2.56	0.86	0.30	1531.7		152	196	213	220
Caloocan City	170	468	761	1033	1280	10.65	4.97	3.10	2.17	5578.3	31	84	136	185	229
Caloocan 1		395	611	766	865		4.46	2.28	1.23	1276.9		309	479	600	677
Caloocan 2		73	150	267	415		7.47	5.94	4.51	4301.4		17	35	62	97
Valenzuela	68	212	340	485	617	12.13	4.83	3.61	2.43	4702.1	14	45	72	103	131
Malabon	88	191	278	335	3701	8.02	3.84	1.87	0.99	2333.6	38	82	119	144	158
Navotas	51	126	187	234	273	9.38	4.00	2.30	1.51	1037.8	50	122	180	226	263
Marikina	70	212	310	430	530	11.69	3.86	3.23	2.12	3892.4	18	55	80	110	136
Pasig	97	269	397	531	642	10.73	3.98	2.94	1.92	3262.5	30	82	122	163	197
Pateros	16	40	52	64	72	9.85	2.67	2.18	1.14	260.0	60	153	199	247	276
Taguig	34	134	266	411	557	14.61	7.11	4.43	3.09	3371.1	10	40	79	122	165
Paranaque	60	209	308	450	571	13.23	3.93	3.87	2.42	3833.5	16	55	80	117	149
Muntinlupa	40	137	277	413	553	12.98	7.29	4.10	2.96	4674.3	9	29	59	88	118
Las Pinas	40	137	296	476	661	13.19	8.03	4.84	3.35	4145.1	10	33	71	155	159
T O T A L	2986	5927	7929	9837	11416	7.1	2.95	2.18	1.50	85787.3	35	69	92	155	133

CASE 2: Alternative Landuse Scenario

	POPULATION (X 1000)					ANNUAL GROWTH RATE (%)				AREA	POPULATION DENSITY (PERSONS/HA				
	1970	1980	1990	2000	2010	80/70	90/80	00/90	10/00	(HA.)	1970	1980	1990	2000	2010
City of Manila	1331	1630	1599	1588	1399	2.05	−0.19	−0.07	−1.26	3830.9	347	425	417	415	365
Manila 1		565	555	543	465		−0.18	−0.22	−1.54	805.8		701	689	674	577
Manila 2		218	197	166	138		−1.01	−1.70	−1.83	570.5		382	345	291	242
Manila 3		428	428	443	402		0.00	0.35	−0.97	935.7		457	457	473	430
Manila 4		418	419	436	394		0.02	0.40	−1.01	1518.9		275	276	287	259
Pasay City	128	288	366	409	403	8.44	2.44	1.10	−0.15	1397.1	92	208	262	293	288
Makati	165	373	453	510	522	8.50	1.97	1.19	0.23	2979.6	55	125	152	171	175
Mandaluyong	93	205	245	274	273	8.27	1.79	1.13	−0.04	1110.3	83	185	221	247	246
San Juan	65	130	126	138	133	7.11	−0.27	0.88	−0.37	557.8	117	233	227	247	238
Quezon City	469	1166	1667	2185	2673	9.54	3.64	2.74	2.04	16616.8	28	70	100	131	161
Quezon 1		272	314	316	321		1.45	0.06	0.16	1488.9		183	211	212	216
Quezon 2		472	847	1374	1858		6.02	4.96	3.06	12256.5		39	69	112	152
Quezon 3		189	206	219	229		0.87	0.61	0.45	1339.7		141	154	163	171
Quezon 4		233	300	276	265		2.56	−0.83	−0.41	1531.7		152	196	180	173
Caloocan City	170	468	761	962	1146	10.65	4.97	2.38	1.77	5578.3	31	84	136	172	205
Caloocan 1		395	611	516	487		4.46	−1.68	−0.58	1276.9		309	479	404	381
Caloocan 2		73	150	446	659		7.47	11.51	3.98	4301.4		17	35	104	153
Valenzuela	68	212	340	518	759	12.13	4.83	4.29	3.89	4702.1	14	45	72	110	161
Malabon	88	191	278	361	428	8.02	3.84	2.64	1.72	2333.6	38	82	119	155	183
Navotas	51	126	187	218	236	9.38	4.00	1.56	0.80	1037.8	50	122	180	210	227
Marikina	70	212	310	451	590	11.69	3.86	3.82	2.72	3892.4	18	55	80	116	152
Pasig	97	269	397	478	527	10.73	3.98	1.86	0.98	3262.5	30	82	122	147	162
Pateros	16	40	52	58	58	9.85	2.67	1.16	0.00	260.0	60	153	199	223	223
Taguig	34	134	266	346	408	14.61	7.11	2.65	0.66	3371.1	10	40	79	103	121
Paranaque	60	209	308	435	573	13.23	3.93	3.53	2.79	3833.5	16	55	80	113	149
Muntinlupa	40	137	277	450	652	12.98	7.29	4.99	3.78	4674.3	9	29	59	96	139
Las Pinas	40	137	296	456	636	13.19	8.03	4.40	3.38	4145.1	10	33	71	110	153
T O T A L	2986	5927	7929	9837	11416	7.10	2.95	2.18	1.50	85787.3	35	69	92	115	133

FIGURE 4.4.1 POPULATION DISTRIBUTION IN METRO MANILA (1980 - 2010)

Case 1: UTDP Landuse Scenario



Case 2: Alternative Landuse Scenario

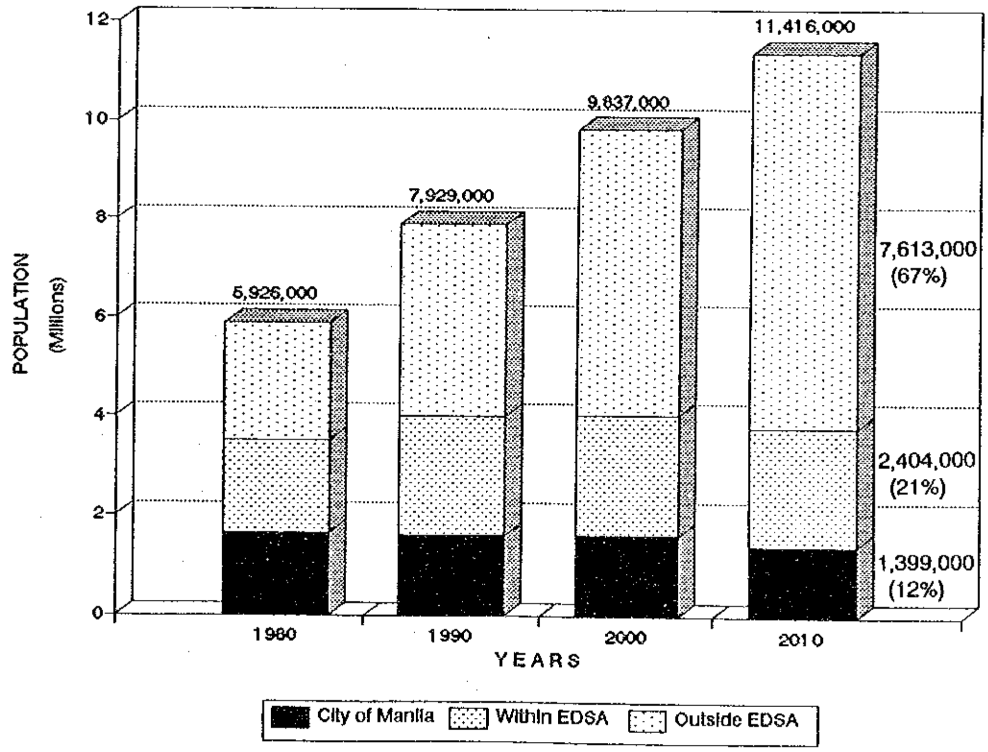


TABLE 4.4.2 SOCIO-ECONOMIC FRAMEWORK FOR METRO MANILA

PARAMETER	1980	1990	2000	2010	AVERAGE GROWTH RATE (%/YR.) 1980-1990	1990-2000	2000-2010
1) Population (000)	5,926	7,929	9,837	11,416	3.0	2.2	1.5
2) Employment at Residence (000)	1,781	2,701	3,384	3,984	4.3	2.3	1.7
3) Employment at Work Place (000)	1,874	2,836	3,638	4,382	4.2	2.5	1.9
4) School Atten-dance at Residence (000)	1,707	1,868	2,243	2,512	0.9	1.9	1.1
5) School Atten-dance at School Place (000)	1,765	2,243	2,580	2,763	2.4	1.4	0.7
6) Car-ownership (no/000 population)	295	556	1,065	1,503	6.6	6.7	3.5

(a) Employment at Residence

- For 1990 estimate, the population of 15 years and over from the 1990 census, ratio of labor force to the 15 years old and above from the 1991 NSO Statistical Yearbook, and employment rate to the labor force from the 1991 NSO Statistical Yearbook were considered.

- For 2000/2010, employment per population is assumed based on past data and is adopted to the population.

(b) Employment at Work Place

- For 1990, employment at work place/that at residence ratio is assumed based on previous studies as 1.05.

- For 2000/2010, employment work place/residence ratio is adopted to the population.

(c) School Attendance at Residence

- For 1990, school attendance is assumed based on the 1990 census of population ages 7 to 24 (then classified into 3 age groups), and the assumed school attendance ratio to population per age group category.

(d) School Attendance by School Place

- For 1990, DECS data is used.

- For 2000/2010, estimated school place/residence ratio is adopted for the future population.

(e) Car-ownership

Car-ownership is a parameter which will be used in traffic demand forecast. As average household income increases, the car-ownership level increases as shown below:

YEAR	% OF CAR OWNING HOUSE-HOLDS	SOURCE OF DATA
1980	9.6%	HIS (JUMSUT)
1983	13.2%	HIS (JUMSUT)
1990	22.8%	UTDP
2000	32.2%	UTDP
2010	36.7%	UTDP

The number of registered vehicles in Metro Manila is shown in Figure 4.4.2. Future car-ownership is estimated by UTDP as shown in Figure 4.4.3.

FIGURE 4.4.2 REGISTERED VEHICLES IN METRO MANILA (1980 - 1990)

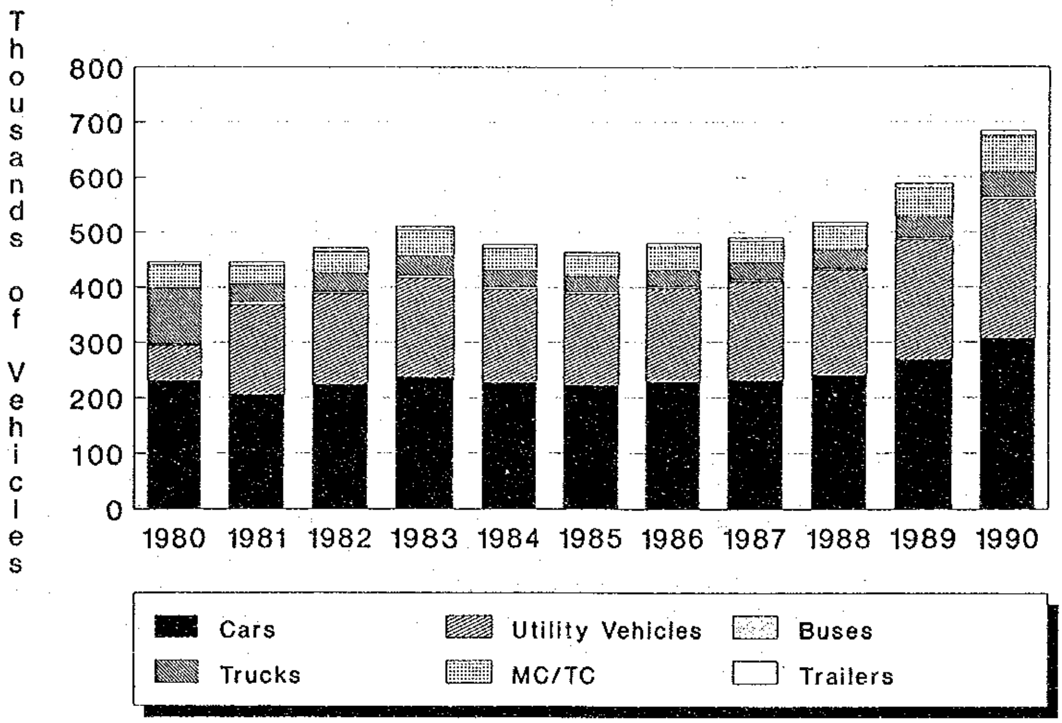
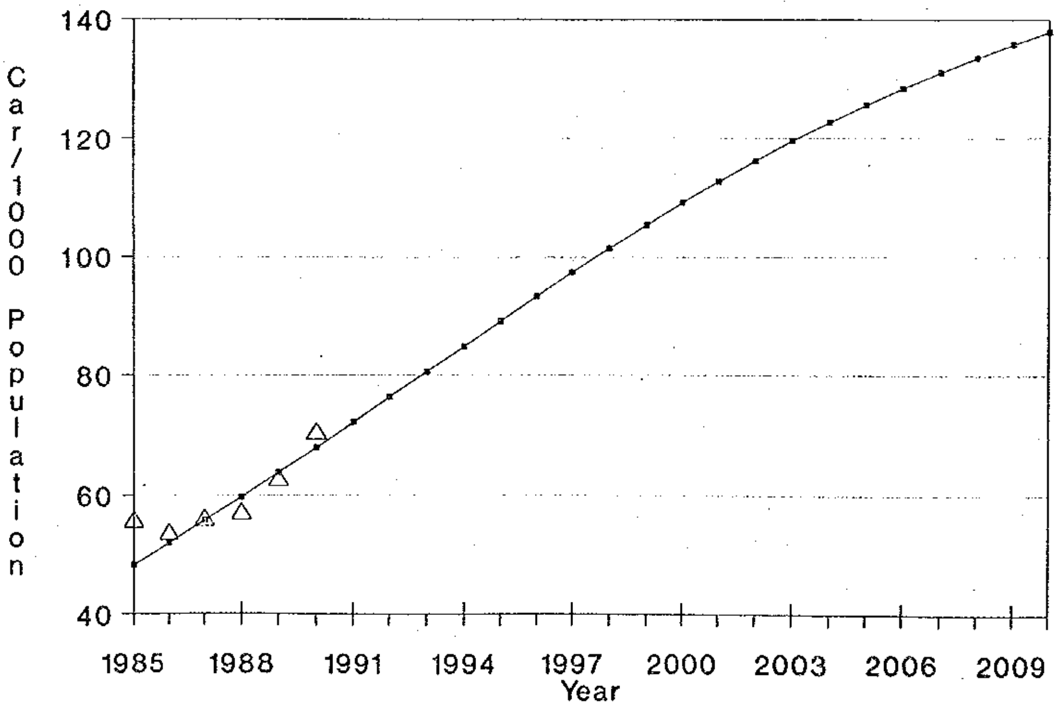


FIGURE 4.4.3 FORECAST OF CAR OWNERSHIP IN METRO MANILA



Source: UTDP, 1991

For zonal breakdown, the methodologies are outlined as follows:

(a) Employment at Residence

- For municipality, 1990 HIS distribution pattern will remain the same for the years 2000 and 2010.

- For zonal breakdown, UTDP distribution pattern is used for the years 2000 and 2010.

(b) Employment at Work Place

- Primary and secondary sectors employment pattern would not change from 1990 pattern, for the years 2000 and 2010.

- Tertiary sector employment distribution pattern, however, will change significantly in accordance to population distribution and urban development scenario on business/commerical activities. Tertiary sector employment is classified into two types, a portion which grow in proportion to population increase (more or less natural growth) and a portion that could be located strategically through planned large-scale commercial/business development. It is assumed that the latter portion is mostly distributed in major commercial/business complexes along EDSA and partly in the strategic areas outside EDSA.

(c) School Attendance at Residence

- For municipality basis, 1990 HIS distribution pattern will remain the same for years 2000 and 2010.

- For zonal breakdown, UTDP distribution pattern is used.

(d) School Attendance at School Place

- For municipality bases, 1990 HIS distribution pattern will remain the same for years 2000 and 2010.

- For zonal breakdown, UTDP distribution pattern is used.

4.5 PREPARATION OF FUTURE OD TABLES (2000/2010)

The major steps taken in the estimate of the future OD tables for years 2000 and 2010 are as follows:

(a) Building of Trip Generation/Attraction Model: On the basis of 1990 OD table and 1990 socio-economic parameters, trip generation and attraction models were built for public and private trips, respectively. (Refer to Table 4.5-1).

TABLE 4.5.1 TRIP GENERATION/ATTRACTION MODELS USED FOR FORECAST

MODE	FORMULA
Private	Generation = 1.196 x (Employ−1) + 0.180 x (Enrol−1) − 8056.6 Attraction = 1.223 x (Employ−2) + 0.172 x (Enrol−2) − 9548.6
Public	Generation = 1.065 x (Day Pop) + 3964.5 Attraction = 1.087 x (Day Pop) − 134.3

NOTE:
Employ−1: Employment at residence
Employ−2: Employment at workplace
Enrol−1 : Enrollment at residence
Enrol−2 : Enrollment at school place
Day Pop : Daytime population

(b) Estimate of Total Number of Trips: Total number of trips for years 2000 and 2010 were estimated based on the analysis of the relationship between household income level and trip rates. As the income level of a household increases, trip rate and dependance on private transport increases. The total number of trips for Metro Manila was estimated to be approximately 18 million and 22 million trips for years 2000 and 2010, respectively. (Refer to Table 4.5.2)

TABLE 4.5.2 ESTIMATED TRAFFIC DEMAND OF METRO MANILA

	1990		2000		2010	
	000/day	%	000/day	%	000/day	%
1. Persons						
– Public Modes[1]	10,079	74.0	11,840	65.5	13,207	61.1
– Private Modes	3,541	26.0	6,229	34.5	8,396	38.9
Total	13,620	100.0	18,069	100.0	21,603	100.0
2. Vehicles (PCU)						
– Public Modes[2]	968	38.5	1,104	29.0	1,221	25.1
– Private Modes	1,546	61.5	2,709	71.0	3,650	74.9
Total	2,514	100.0	3,813	100.0	4,871	100.0

1/ Including those using rail (PNR/LRT)

2/ Excluding those of rail demand (0.4, 0.8 and 1.2 million for years 1990, 2000, and 2010, respectively). Assumed PCU conversion factor private transport and for road-based public transport modes is 2.3 and 10, respectively.

(c) Estimate of Trip Generation/Attraction by Zone: Trip generation and attraction were estimated for 66 zones of Metro Manila. The results are shown in Summary form in Table 4.5.3.

(d) Estimate of Trip Distribution: Taking into account the considerable changes in the future transport network, trip distribution was estimated based on the following assumptions;

- One half of the future trip demand would be distributed according to the present pattern.

- The remaining one half would be distributed according to the distribution pattern to be estimated based on a gravity model built.

The resultant OD tables for year 2000 and 2010 for private transport in terms of PCU which are the input for this Study are shown in Table 4.5.4 and Table 4.5.5, respectively.

TABLE 4.5.3 ESTIMATED TRIP GNERATION/ATTRACTION OF METRO MANILA TRIP DEMAND (PRIVATE TRANSPORT)

(UNIT: TRIPENDS)

TRAFFIC ZONE	NO. NAME	1990	2000	2010
METRO MANILA	1. Manila 1	237142	451164	636096
	2. Manila 2	230708	457233	656034
	3. Manila 3	452080	721614	918063
	4. Manila 4	541773	938643	1259904
	5. Pasay City	141308	305031	423439
	6. Airport Area	42981	85638	123626
	7. Makati	1008334	1698355	2248984
	8. Mandaluyong	271673	467121	624008
	9. San Juan	174361	278204	355933
	10. Quezon City 1	393632	624586	796244
	11. Quezon City 2-1	173119	330126	466400
	12. Quezon City 2-2	149077	231105	289947
	13. Quezon City 2-3	156240	288347	400542
	14. Quezon City 2-4	150475	286114	403447
	15. Quezon City 3	217248	371588	495549
	16. Quezon City 4	294694	491775	646245
	17. Kaloocan South	169361	340916	492046
	18. Kaloocan North	28010	68713	107298
	19. Valenzuela	184842	344289	480375
	20. Malabon	95560	190694	274300
	21. Navotas	23617	69304	113858
	22. Marikina	188403	323950	433260
	23. Pasig	202208	375689	523367
	24. Pateros	102344	167260	217303
	25. Taguig 1	148880	240220	309504
	26. Taguig 2	31612	84189	135047
	27. Paranaque	306793	499463	646064
	28. Muntinlupa	228827	395433	530975
	29. Las Pinas	148778	268799	356091
OUTSIDE METRO MANILA	30. Meycauyan	130366	227230	305865
	31. San Jose del Monte	9544	16592	22361
	32. Montalban	7631	13352	17986
	33. East	85779	149753	201987
	34. Batangas	70040	121936	164504
	35. Cavite	59298	103574	139350
TOTAL		6856738	12028000	16216002

TABLE 4.5.4 YEAR 2000 PRIVATE TRANSPORT OD TABLE (PCU)

PCU OD Table
Manila 2000
Double Triangle

COMPRESSED DISTRIBUTION FOR Private

DISTRICT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	34750																	
2	22534	33226																
3	13965	12996	82852															
4	34489	35284	43061	68922														
5	5502	6413	9473	19040	20842													
6	968	5588	605	2942	1935	2530												
7	22063	14008	27272	64915	24173	5292	236690											
8	3752	2179	12904	7028	2803	831	34872	44754										
9	2347	1856	7046	11169	3018	137	13866	5338	32804									
10	11517	10961	11247	17675	3007	426	14909	19998	4356	90214								
11	2549	3127	7754	5332	592	125	10596	2216	2987	12803	11818							
12	1502	2843	4393	6433	214	73	18295	677	891	4455	15034	15684						
13	723	1315	5743	2261	743	99	16696	743	554	3160	3030	3279	29446					
14	1581	2124	3148	5680	10408	104	10018	1074	789	15479	8224	3016	13768	12912				
15	3704	7863	18191	7260	952	434	22798	5488	7219	6189	8775	6813	1373	2225	18142			
16	7363	6567	14152	16144	667	184	22063	4739	10625	13168	12428	8050	2281	7195	15345	48350		
17	4514	4468	6598	5996	1641	177	13901	1374	1855	13970	21226	1066	6996	8100	3601	3220	23476	
18	119	110	152	250	52	20	972	99	355	375	332	519	14759	1034	483	212	2143	5224
19	1553	2587	1698	6111	719	129	2467	3728	432	4277	1308	990	6450	7525	1395	1113	7419	822
20	1443	1781	1457	12979	886	96	4433	1191	1075	3246	902	495	1322	3239	1534	1250	7320	177
21	1326	2305	648	1590	235	70	624	166	129	1135	409	209	457	551	201	654	2048	78
22	893	8016	2067	2679	358	4522	19328	1434	3562	2303	5272	2043	786	842	6135	4086	852	159
23	3599	971	6110	4714	1488	818	24843	23269	4317	1649	3925	1802	915	1154	5360	6011	725	116
24	208	237	345	3357	542	153	23706	2519	405	277	357	151	152	137	710	513	131	27
25	717	868	1007	6587	5194	999	91365	4522	1003	669	715	365	348	971	2297	2082	321	73
26	578	578	1196	1092	584	215	4036	709	352	226	202	136	167	138	305	278	142	39
27	8980	3754	4784	11182	5209	4252	32979	6799	1216	2509	471	351	457	415	1562	1081	577	117
28	1699	1927	8174	2740	2997	633	20647	6385	891	1971	294	336	304	323	697	1732	272	368
29	1165	2222	6908	2763	1649	1664	8645	1138	241	448	711	214	304	430	419	2126	390	80
30	1016	859	1216	1000	122	42	1134	415	115	1873	1013	376	7251	2641	1802	1333	3741	557
31	123	258	74	49	11	21	110	48	27	67	23	290	662	107	236	162	749	124
32	30	90	95	94	49	16	218	32	24	51	83	397	91	105	514	85	32	87
33	445	562	449	942	459	95	2452	1973	1425	827	942	395	338	418	2946	936	352	49
34	954	564	373	1887	926	466	3347	631	175	277	298	200	201	406	764	697	535	290
35	849	1187	321	3800	2130	1237	4042	598	300	194	158	70	314	252	484	403	796	47
TOTAL	199520	202228	318474	417446	135033	37898	817775	206426	122900	275908	146031	102057	127488	126533	164216	217285	150724	30420

DISTRICT	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
19	50114																	
20	13650	13624																
21	3401	4469	7822															
22	1081	370	344	55164														
23	470	1253	149	6646	33636													
24	103	62	39	376	4654	1778												
25	252	168	119	681	5839	18051	25934											
26	135	89	59	279	1157	1546	5290	7178										
27	495	336	257	2743	3012	510	2486	4658	77632									
28	449	214	128	1072	8416	350	3326	3199	26493	46098								
29	310	783	154	743	1108	207	3371	684	7801	18806	40482							
30	28407	3547	386	224	1264	48	100	180	333	361	661	29422						
31	881	35	11	44	71	5	15	20	65	28	19	347	2052					
32	195	34	12	1269	86	7	29	11	30	21	21	56	4	868				
33	285	226	122	6055	5384	194	250	108	628	242	266	859	60	689	29504			
34	1009	267	106	284	524	40	689	295	2293	11130	2319	2115	137	106	1173	14612		
35	271	366	278	454	673	57	249	139	4207	2055	9437	59	7	33	475	831	6368	
TOTAL	152231	84319	30691	143166	166128	61954	186952	36000	220674	174778	118689	94875	6942	5564	62525	50911	43161	5437922

TABLE 4.5.5 YEAR 2010 PRIVATE TRANSPORT OD TABLE (PCU)

COMPRESSED DISTRIBUTION FOR Private

DISTRICT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	46386																	
2	35929	45662																
3	23898	21935	92278															
4	48650	53308	57216	88874														
5	7357	9055	11248	28784	26194													
6	1378	6177	1063	4900	3264	3120												
7	27014	21514	35859	90693	39399	8268	325672											
8	5046	3454	15326	10744	4503	1264	58740	49922										
9	3227	2721	8780	12764	3395	245	17808	7680	34838									
10	15614	15155	18075	22754	3708	619	18499	21379	5904	96374								
11	3998	4505	10594	7236	913	233	13322	3908	5048	19322	13656							
12	1848	3202	4946	6940	318	114	19106	1068	1361	5627	18612	17486						
13	1288	1786	6354	2887	909	174	17682	1176	931	5202	5220	7291	34038					
14	2712	3322	4468	6885	10656	197	11272	1627	1438	20441	13232	4434	24416	18040				
15	4624	6665	20088	8704	1435	574	28344	9243	11704	8821	13715	7739	2122	3607	21902			
16	9481	8757	18565	19143	1142	331	26167	7277	15187	18223	19317	9489	3470	9098	23387	56406		
17	8342	8099	9954	9104	2150	346	16027	2120	2467	23944	24307	1768	8650	12483	4935	5441	34998	
18	233	210	274	394	90	40	1198	198	426	678	643	1584	23288	2039	611	395	2409	7244
19	2693	3655	2726	7259	969	226	3562	4112	682	6650	2345	1556	10574	10795	1956	1926	11270	1588
20	3321	3056	2562	14229	1140	181	5326	1476	1320	5474	1708	784	2203	4873	1975	1935	12606	333
21	3115	3435	1314	2706	593	161	1370	335	243	2037	732	315	775	1016	384	928	3733	145
22	1513	8636	3142	3678	615	4633	21436	2606	4814	3814	10606	5456	1713	1985	9157	7236	1690	411
23	4267	1611	7191	6583	2431	1095	35903	29554	6618	2858	6285	2494	1448	1923	9912	8901	1388	241
24	384	441	600	4070	951	280	28432	4198	699	484	666	236	266	261	1289	923	255	57
25	1223	1496	1611	8726	6517	1382	105125	7214	1535	1074	1222	523	560	1234	3276	2814	561	127
26	865	914	1509	1988	1164	451	7148	1314	501	412	388	216	304	259	564	509	289	80
27	10003	5054	5685	14979	8274	8388	40239	8058	1494	2947	740	455	647	621	1981	1465	958	174
28	2246	2556	8765	4344	3968	1089	25469	7249	1106	2335	614	504	596	571	1055	2104	586	460
29	1728	2921	7409	4601	2834	2505	11394	1634	413	750	896	302	473	607	654	2374	649	134
30	1284	1041	1301	1210	207	80	1336	486	143	1991	1119	532	9196	2980	1870	1424	4087	1181
31	140	271	91	77	19	24	158	64	38	96	54	346	769	147	254	189	774	202
32	50	111	122	125	59	22	274	53	43	91	142	605	208	166	544	123	60	119
33	561	676	616	1141	553	140	3184	2346	1686	1035	1303	911	569	575	3377	1261	495	122
34	1014	638	433	2043	1000	565	3575	683	194	317	328	216	236	441	792	720	575	302
35	975	1338	427	4161	2325	1405	4606	706	337	257	201	89	358	299	529	456	859	63
TOTAL	282407	291306	406425	561900	188139	54934	1075121	276763	157790	352961	207130	128473	177779	179120	219793	286564	218379	47693

DISTRICT	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
19	69156																	
20	23656	16516																
21	6059	6952	9502															
22	1607	739	511	66458														
23	859	1521	282	11214	44060													
24	188	115	79	808	8703	2862												
25	420	288	236	1183	9140	20779	29356											
26	267	177	141	505	2100	2052	8045	10420										
27	753	550	470	3022	3850	937	4244	6633	90196									
28	759	411	303	1453	9127	678	4667	6899	35253	67546								
29	521	952	295	950	1526	368	4002	1204	18277	24641	43466							
30	31497	4263	1809	343	1342	71	152	238	443	505	761	51186						
31	918	54	20	79	93	12	26	31	81	55	35	375	3610					
32	239	53	19	1358	116	13	45	20	46	45	35	71	8	1646				
33	408	305	160	7981	6357	305	432	289	754	403	360	898	76	720	42604			
34	1054	295	127	326	574	61	747	429	4072	14118	5788	2138	140	110	1193	16306		
35	323	404	319	499	758	86	348	252	4709	3086	12464	84	12	36	496	7091	7694	
TOTAL	213228	121757	50621	192177	232325	82609	230330	58577	286452	235566	157923	127644	9338	7497	84292	68641	58052	7329706

Note : Location of zones is shown in Figure 3.1.2. Zone 1 to Zone 29 are within Metro Manila, while Zone 30 to Zone 35 are outside Metro Manila.

4.6 CHARACTERISTICS OF PRIVATE TRIPS DISTRIBUTION

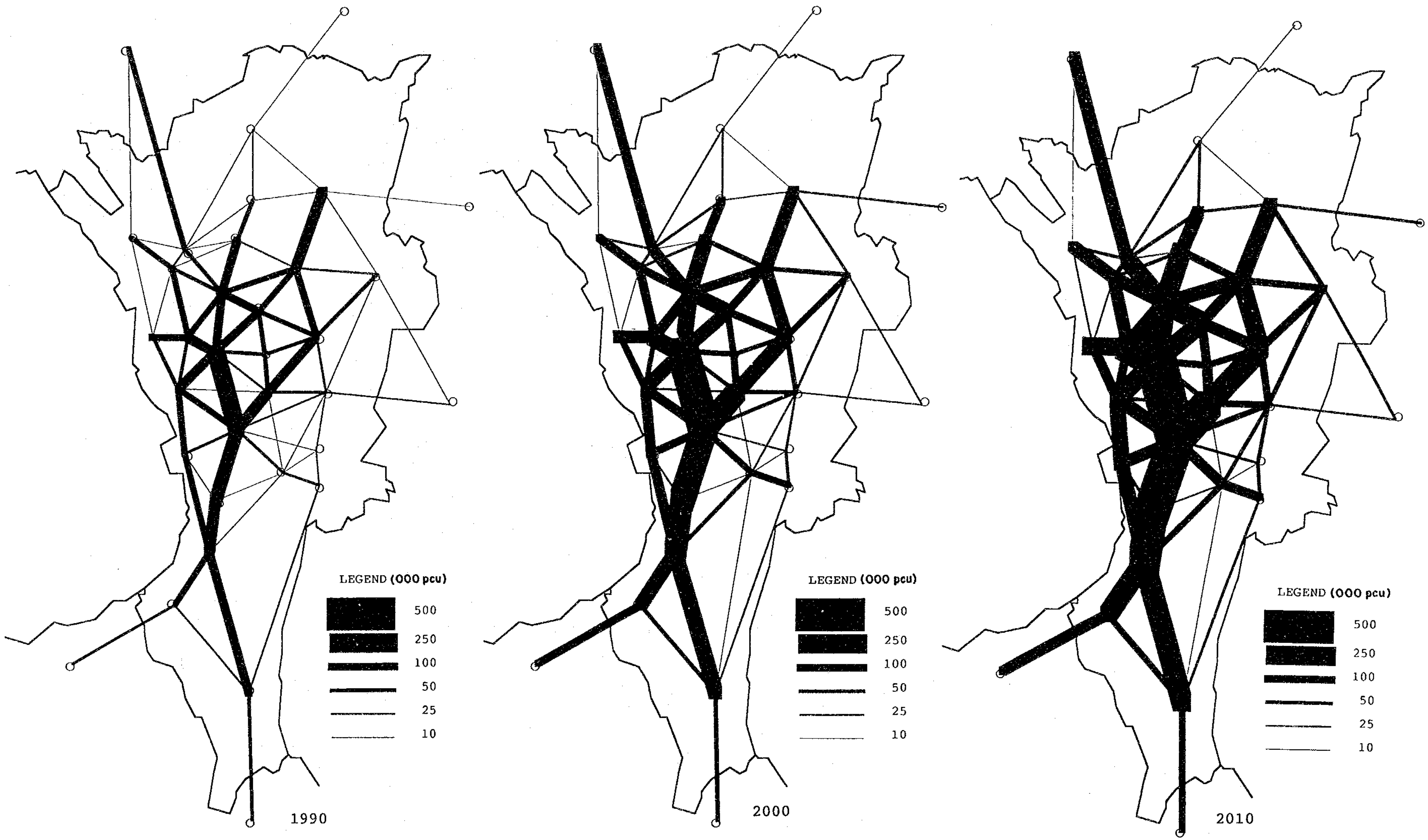
In order to understand the characteristics of private trip demand in more realistic manner, the trip demand in the form of OD tables has been assigned on spider network (Refer to Figure 4.6.1). The characteristics are as follows:

- Overall demand assigned on spider network represent relatively well the actual road network and demand distribution pattern. This is to say that Metro Manila's road network is basically structured in such a way that it meet more directly the traffic demand, unlike many other cities where they are quite different each other.

- Overall distribution pattern of private trips is, however, not in radial/circumferential pattern but rather north-south directions mixed with radials. Axis via Makati area show the most significant private trip distribution with strong links with traditional Manila CBD, Quezon City as well as suburban areas of north, east and south.

Traffic congestions which are currently experienced in the Makati CBD area, along EDSA and SSH/MSR, and in many radial roads outside EDSA would, therefore, be farther accelerated in the future.

FIGURE 4.6.1
ROAD TRAFFIC DISTRIBUTION ON SPIDER NETWORK (PRIVATE ONLY)



CHAPTER 5

URBAN EXPRESSWAY PLANNING OPPORTUNITIES AND DIRECTIONS

CHAPTER 5

URBAN EXPRESSWAY PLANNING OPPORTUNITIES AND DIRECTIONS

5.1 NEEDS AND ROLE OF URBAN EXPRESSWAYS

As urban transport problems in many large cities of developing countries get serious, the development of urban rail mass-transit systems and urban expressways become more the concern of the government. For example, Singapore realized about 70 km of Mass Rapid Transit (MRT) and 80 km of expressways (toll-free). Jakarta opened a portion of 42 km toll expressways in addition to grade separation of existing railways, Bangkok operates 27 km of first stage toll expressways while the second stage is under construction.

Development policies on urban expressways among these cities vary from each other. Expressways in Singapore are operated as part of a comprehensive urban transport policy which, at the same time, enforces strict control on ownership and utilization of cars and implements the improvement of public transport systems, and charges no toll. In other cities, expressways are constricted, mainly aiming at providing routes to avoid traffic congestions. Financing mechanism is not institutionalized and implementation methods vary from direct government undertaking to BOT scheme. The economic and social justification of expressway development, which mostly benefits private vehicle users, has not been made clear in the total urban transport system development. Thus, the expressways developments are not sufficiently supported with and by institutions and financing system.

In order to meet the transport demands of Metro Manila, with more than 10 million population expected in the near future, the establishment of a valid urban transport policy, such as the strengthening of traffic management, expansion of public transport services, and especially, the effective operation of private transport which shares about 40% of passenger-kms or 80 to 85% of vehicle-kms of road transport, is critical. Building of a new urban road system by adding expressways to at-grade road network is considered to be an effective measure not only to reduce traffic congestion but also to improve the hierarchy of the urban transport system for both the private and public transport users and operators.

The main objectives of the Metro Manila urban expressways are more specifically as follows:

(1) To provide alternative transport facilities with higher service level.

As Metro Manila grows physically and economically, transport demands increase and diversify. A segment of the demands sensitive to time value and comfort and, therefore, requiring higher services is expected to become larger. The availability of alternative high quality transport facilities would contribute to segregate the demands effectively and to improve the overall efficiency of the transport system of Metro Manila.

(2) To promote the effective urban expansion and development of a competitive urban system.

Accessibility greatly affects landuse. This is typically seen in Metro Manila where developments make progress along major transport corridors, especially C-4. The development of an urban expressway network would, therefore, affect the future urban formation of Metro Manila, revitalizing the CBD, strengthening the interactions between the CBD and sub-centers, and encouraging new urban and suburban centers' development. An expressway system is considered as a strategic means of future development of Metro Manila.

The efficiency of infrastructure in capital cities directly affects the performance of the national economy, as well as the promotion of foreign investments for which competition among Asian cities is becoming fierce. The provision of a reliable transportation for airport, port, industrial complexes, business centers, etc., for Metro Manila and its environs is a specific objective of expressway development.

(3) To encourage the improvement of urban environment and amenities.

Guidance of proper landuse and the segregation of different types and levels of traffic would contribute to the improvement of urban environment and amenities.

The more specific objectives of urban expressways development in Metro Manila are explained as follows:

(a) Increased Efficiency of Urban Transport System: An integrated transport policy has to be implemented to cater the needs of a mega city with more than 10 million population in the near future. In addition to more effective traffic management, public transport system improvement and expansion, effective management of private mode traffic which will share no less than 40 percent in terms of persons and more than 80 percent in terms of vehicles by year 2010 will become a critical issue. An addition of a new component of urban transport system, urban expressway is expected to strengthen the hierarchical structure and overall efficiency of urban road system.

(b) Increased Convenience of Private Transport: Private transport users are composed of those with different purposes and varied needs who respond very sensitively to time values. Expressways would particularly benefit those sensitive to time reduction, thus encourage vitalization and effectiveness of socio-economic activities. They are the type of expressway users who are willing to pay charges for the services provided.

(c) Benefits to Non-Expressway Road Users: Adequate alignment and planning of expressways could rationalize the overall traffic flow on the other roads, contributing to the mitigation of traffic congestions, increase in road safety, environmental improvement and so on. Whether or not expressways could enhance directly or indirectly the effective management of public transport system greatly affect the social acceptance of expressway construction.

(d) Promotion of Effective Landuse/Envisioned Urban Development: As is well proven, accessibilities bring about great impact on landuse. Rapid development along EDSA is largely attributed to the relative deterioration of accessibilities in the inner areas, as well as progress of suburbanization. As needs to better accessibilities become stronger in the future, expressway development has to be considered as a strategic urban development measure left for Metro Manila to promote effective urban development.

(e) Promotion of Investment: The efficiency of urban infrastructure of capital/large cities which usually generate 30 to 50 percent of the country's GDP is a critical factor internally for efficient economic growth and externally for fierce competition of attracting foreign investments among cities in the region. Quality transport infrastructure is an important component including early access to international ports and airports, business centers, industrial estates, etc., and integration of urban and intercity network.

5.2 RELATED TRANSPORT PROJECTS FOR EXPRESSWAY PLANNING

Various transport projects which must be taken into consideration for expressway network planning are summarized hereunder.

1) Road Projects

All on-going, committed and planned road projects were listed up and their implementation schedule was reviewed by the DPWH counterparts and the Study Team. Some of on-going projects are being delayed due to R-O-W acquisition and squatter problems. Taking into accounts such problems and in due consultation with DPWH, a road development program up to year 2010 was established as shown in Figure 5.2.1 which was approved by DPWH at the First Consultation Meeting held on May 13, 1992. Implementation schedule of each project is attached in Appendix 5.2.1.

2) Rail and LRT Projects

Rail and LRT projects to be completed by year 2010 are presented in Figure 5.2.2. Major projects are construction of LRT Line 2 and Line 3.

Line 2 will start at D. Jose Station of Line 1 and end at Katipunan Ave. in Quezon City via Lerma Street, España, E. Rodriguez and Aurora Blvd. All stretch will be elevated.

Line 3 will be constructed along EDSA from F.B. Harrison St. in Pasay and end at North Ave. in Quezon City and will be extended up to Rizal Ave. Extension in the future. Line 3 will be at-grade with grade separation at major intersections.

3) Existing Expressway Proposals

There are nine expressway proposals at present as shown in Figure 5.2.3.

Philippine National Construction Corporation (PNCC) has been given franchise since 1983 to build and operate Metro Manila Tollway which is proposed to traverse along C-6 alignment. Although any single section has not been built yet, Metro Manila Tollway is considered as the committed project under this Study.

R-1 Extension was completed as partially access controlled expressway on reclaimed land and is planned to be coverted to a toll facility in order to upgrade its service level.

Feasibility Study of an elevated expressway from Alabang to Quirino Ave. which is now called as "Manila South Tollway" has been completed in 1992.

Feasibility Study of C-5 from R-10 to North Luzon Expressway and R-10 from C-4 to C-5 is being undertaken and is proposed to be implemented by BOT.

Other roads proposed to be implemented by BOT are: C-5 from R-1 to South Luzon Expressway and C-5 from North Luzon Expressway to Commonwealth Ave., both of which detailed engineering design has been completed with partially access controlled concept.

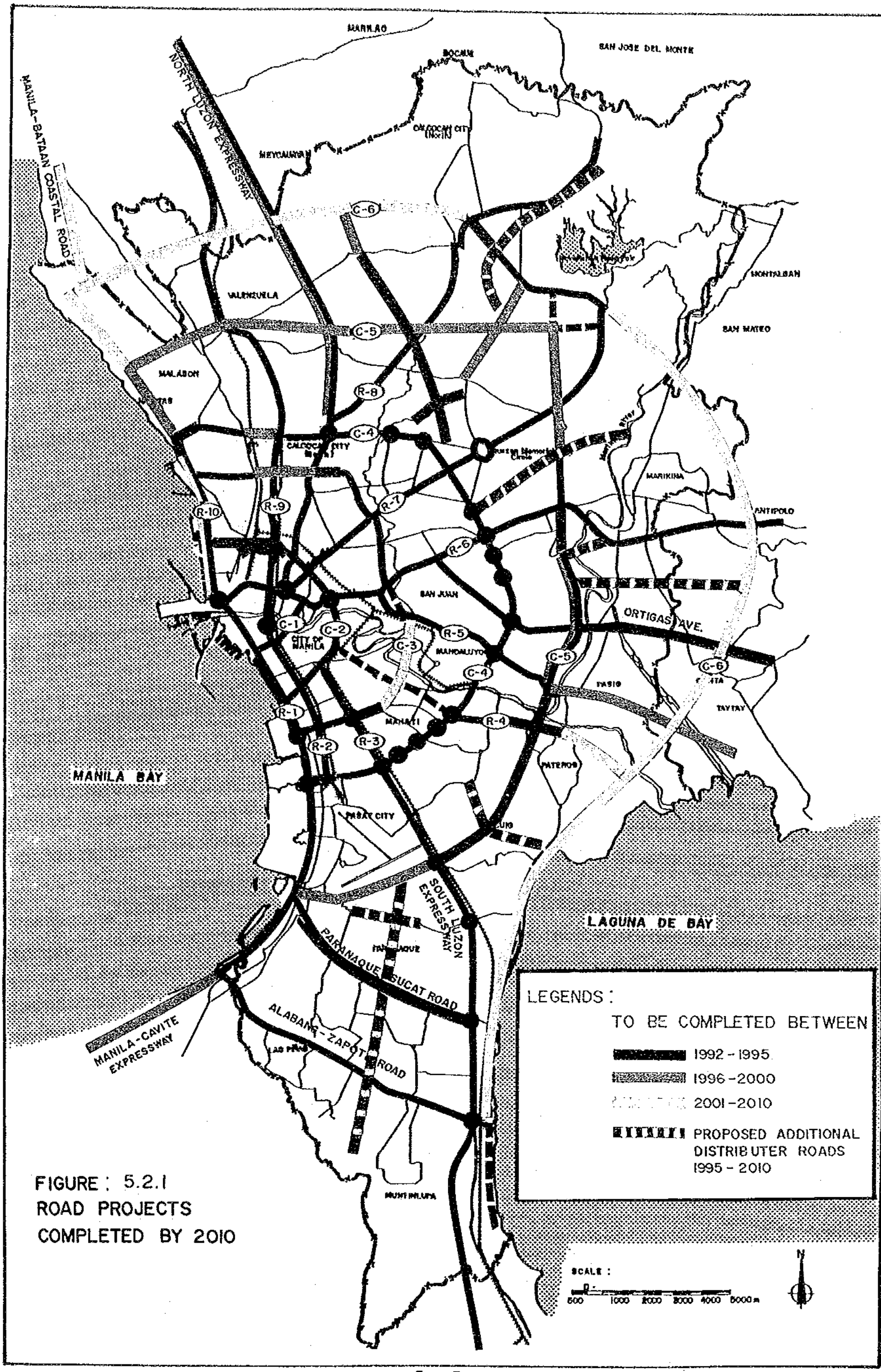


FIGURE : 5.2.1
ROAD PROJECTS
COMPLETED BY 2010

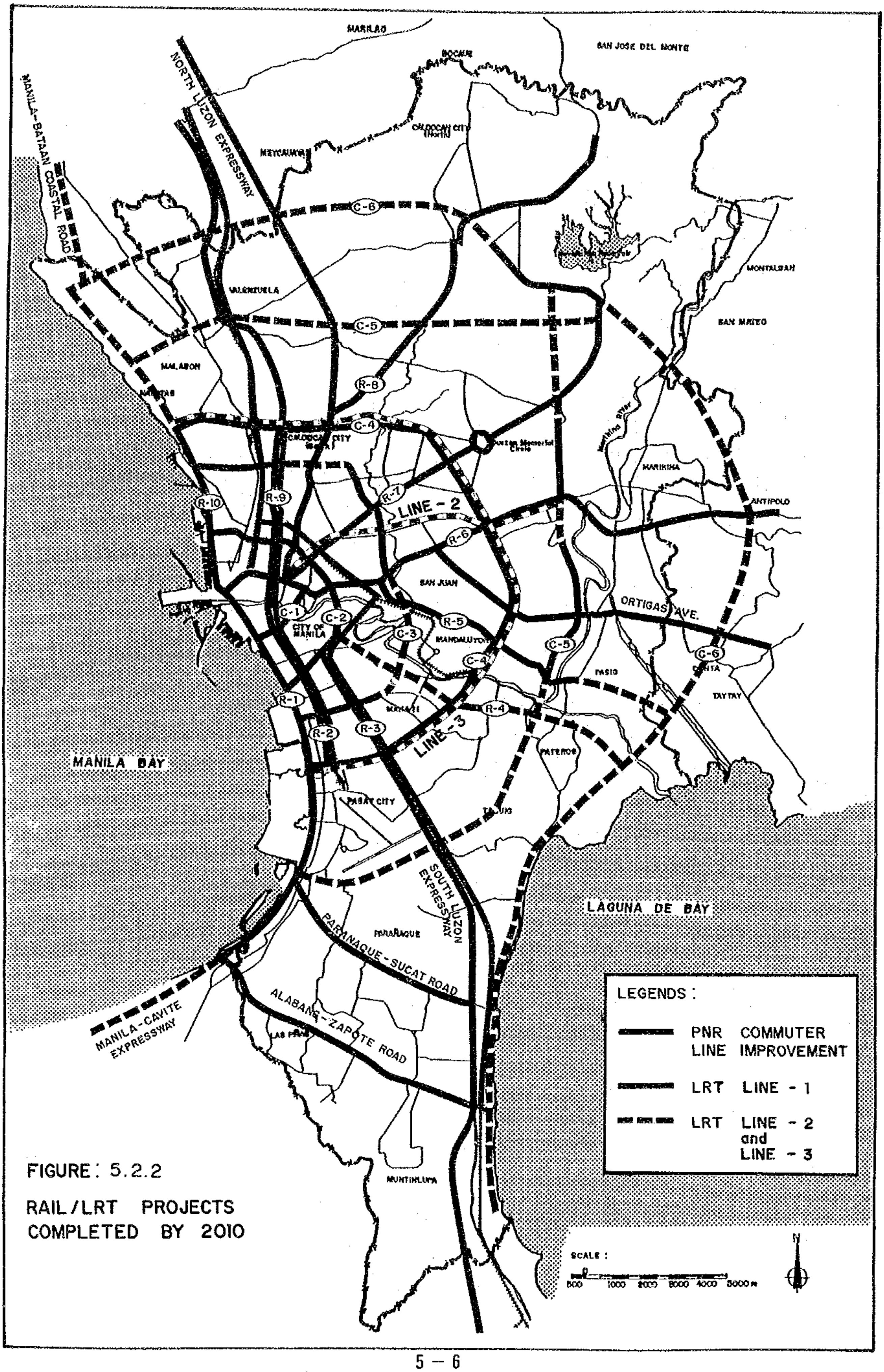


FIGURE: 5.2.2

RAIL/LRT PROJECTS COMPLETED BY 2010

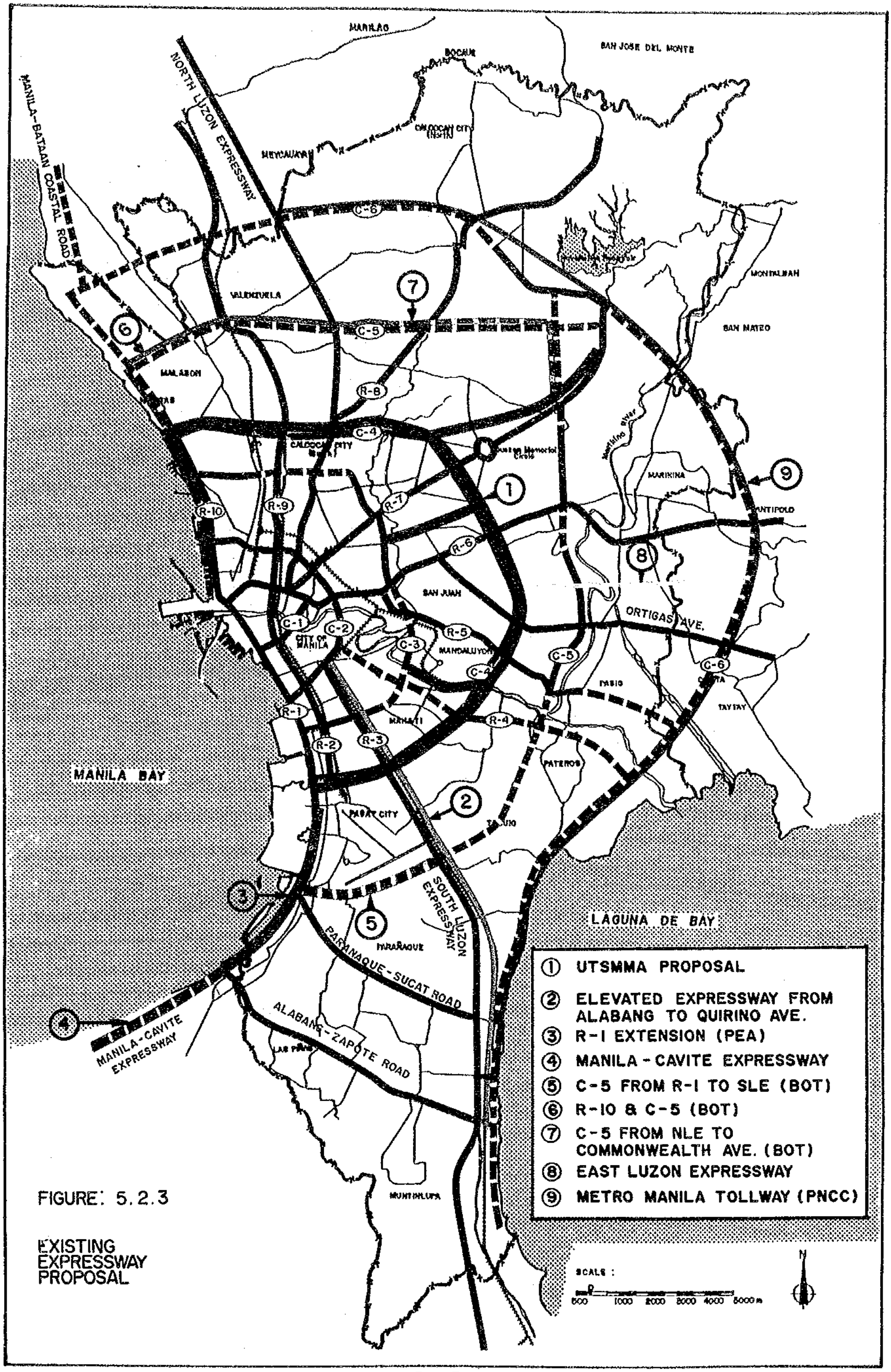


FIGURE: 5.2.3

EXISTING EXPRESSWAY PROPOSAL

5.3 ASSESSMENT OF PRESENT/FUTURE ROAD NETWORK (WITHOUT EXPRESSWAYS)

1) Network Assessment Methodology

For traffic assignment, a model has been used. Prior to the application of the model for expressway planning, necessary input data such as OD table, network, link data, traffic volume-speed relationship, etc. have been prepared based on which the model was calibrated against actual traffic conditions. The work undertaken in this task is more specifically as follows:

a) Preparation of Road Network and Link Data

At-grade road network which is the basis for expressway network analysis has been worked out on the basis of available information as shown in Figure 5.3.1. The Metro Manila road network has been simplified to match assumed zoning system and to avoid unnecessary complication for the assessment.

Furthermore, road networks for year 2000 and 2010 were also prepared as shown in Figure 5.3.1 based on DPWH's implementation schedule of major road projects identified in Section 5.2. Major road projects to be completed by years 2000 and 2010 are as follows:

<u>By Year 2000</u>

- All sections of C-2
- C-3 from A. Mabini Street to Araneta Avenue
- All sections of C-5
- Shaw Blvd. Extension
- Visayas Avenue
- Mindanao Avenue
- R-10 from C-4 to C-5
- Manila-Cavite Coastal Road

<u>By Year 2010</u>

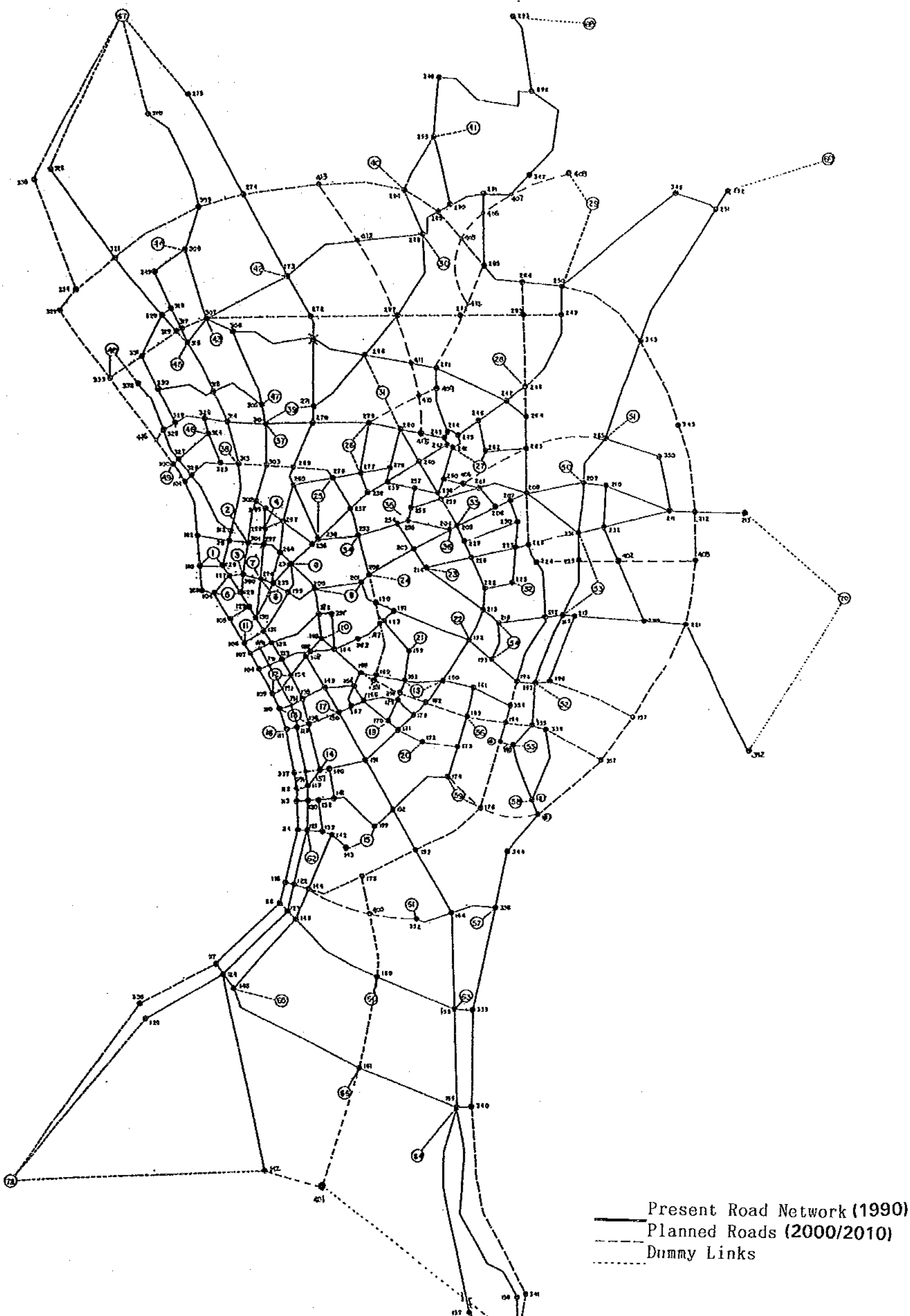
- All sections of C-3
- All sections of C-6
- Widening of R-10 from C-1 to C-4 and Construction of the section from C-5 to C-6
- Additional distributer roads located outside EDSA

For each link of road networks for 1990, 2000 and 2010, link information such as link length, no. of lane, speed flow curve have been prepared.

b) Calibration of Traffic Assignment Model

Based on 1990 road network and 1990 OD table, the traffic assignment model was calibrated by comparing model output with the actual observed traffic volume at selected roads sections. The results of the calibration are summarized in Table 5.3.1 which gives the following characteristics:

FIGURE 5.3.1
AT-GRADE ROAD NETWORK FOR TRAFFIC ASSIGNMENT



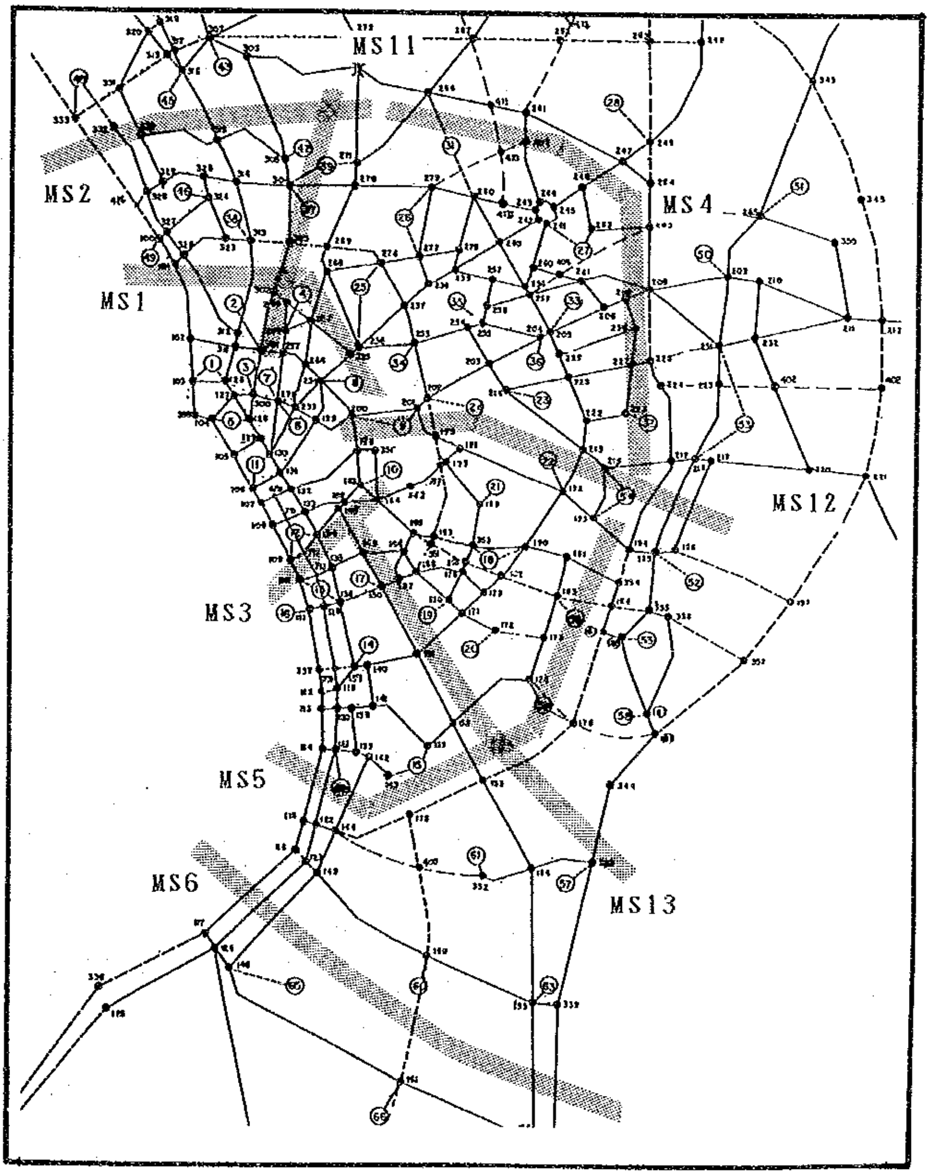
(a) Across the screenlines set for east-west (Pasig River) and north-west (San Juan River and PNR) directions, observed traffic volume and assigned traffic volume are within acceptable ranges of differences, though west section of east-west screenline has more assigned traffic volume than observed traffic volume by 14% and south section of north-south screenline has less assigned traffic volume by 11%.

(b) These comparison were also made for more detailed mini screens to assess the calibration by major radial/circumferential directions of Metro Manila road network. (Refer to Figure 5.3.2). The results indicate that across MSI assigned traffic volume is more than observed traffic volume by 20%, and across MS6 and MS11 assigned traffic volume are less by 18% and 11%, respectively.

TABLE 5.3.1 RESULTS OF 1990 TRAFFIC CALIBRATION (PRIVATE VEHICLES ONLY)

LOCATION	TRAFFIC VOLUME (PCU) OBSERVED	ASSIGNED	B/A RATIO
Screen Line			
East–West (west)	253,053	288,704	1.14
East–West (east)	226,055	222,122	0.98
North–south (north)	357,124	361,807	1.01
North–south (south)	301,839	269,848	0.89
Mini–Screen			
MS1	265,682	319,150	1.20
MS2	71,232	74,007	1.04
MS3	215,991	225,742	1.05
MS4	218,940	224,043	1.02
MS5	199,678	210,850	1.06
MS6	128,382	105,168	0.82
MS11	78,652	69,711	0.89
MS12	235,664	223,383	0.95
MS13	254,147	236,407	0.93

FIGURE 5.3.2
LOCATION OF MINI SCREEN



2) Assessment of Road Network (Without Expressway)

a) Assessment Criteria

Road networks of Metro Manila under "Without Expressway" situation for years 1990, 2000 and 2010 were assessed by assigning traffic demands onto the assumed road networks of respective years. Three situations in terms of at-grade road network were assumed as follows:

Do Nothing Situation: No investment for road construction/ improvement is made, thus the 1990 road network remains as it is even up to year 2010.

Do Something Situation-1: Implementation of planned road projects is delayed and the planned 2000 road network is achieved only in year 2010.

Do Something Situation-2: All planned road projects are implemented in accordance with planned implementation schedule and the 2010 road network is completed by year 2010.

In order to assess the overall performance of the Metro Manila road networks which were divided into two: those within EDSA and those outside EDSA, following indicators were selected:

(a) Vehicle-kms: This indicates total kilometrages of vehicles (pcu) run on the network.

(b) Vehice-hours: This indicates total time spent by vehicles (pcu) on the network.

(c) Average trip speed: This gives a level of travel speed of an average vehicle on the network.

(d) Average V/C ratio: This indicates the degree of traffic congestions of the network. V/C ratio is set in such a way that V/C ratio of 1.0 represent more or less a travel speed of 15 kph.

The characteristics of road network performance are shown in Table 5.3.2 and Figure 5.3.3.

b) Assessment of Do Nothing Situation

Performance of the existing (1990) road network can be summarized that the 1990 road network, as a whole, has more or less reached to its capacity, average travel speed of overall road network is about 26 km/hour. It is estimated to be about 22 km/hour inside EDSA and about 29 km/hour outside EDSA, and average V/C ratio is about 0.8 for overall network, wherein 0.9 for inside EDSA and 0.7 for outside EDSA.

If no network expansion is made, the situation will quickly worsen towards years 2000 and 2010. By year 2000, while vehicle-kms (more or less traffic demand) increase by 44% vehicle hours increase by 170%, thus average travel speed decrease by about 50%. By year

2010 while vehicle-kms increase by 82%, vehicle hours increase by 460% and average travel speed decrease by 70%. The situation gets worse both inside and outside EDSA and the situation in year 2010 clearly indicates that existing projects and plans of at-grade roads are not sufficient at all to meet the traffic demand.

c) Assessment of Do Something Situation

If various road projects/plans are implemented the traffic situation worsens less significantly. By year 2010, average travel speed on year 2000 network decreases to 11.8 km/hr and an year 2010 network to 16.4 km/hr. Under Do Something Situation, the traffic situation outside EDSA worsens less significantly than inside EDSA, reflecting that more road projects/plans are implemented in the areas outside EDSA.

d) Overall Assessment of Road Network

(a) The traffic situation would worsen promptly towards year 2000. Almost all the major roads would be saturated, particularly within and around EDSA, although, at the same time, the addition of some at-grade major roads construction would contribute to mitigate the traffic congestions to a certain extent. The traffic situation would further deteriorate towards year 2010.

(b) The traffic situation inside EDSA in year 2010 would be very chaotic, even though all on-going and planned road projects are completed. To construct more at-grade roads than currently planned will be increasingly difficult due to ROW acquisition and affected people's dislocation problems, therefore, construction of expressways over available public spaces will be one of the key solutions to cope up with sharply increasing traffic demand.

(c) The traffic situation outside outside EDSA in year 2010 would be also critical where urbanization is rapidly progressing. As more people will reside far away from their working places, to provide faster means of transportation like an expressway is definitely needed which will contribute not only to mitigation of traffic problems, but also for sound development of urban centers.

(d) As traffic congestions worsen, it is not only vehicle-kms that would become larger but, more significantly, vehicle-hours would become tremendous.

(e) The effects of the currently on-going/planned major roads development are great particularly in the area outside EDSA such that their early completion should be seriously pursued.

3) Traffic Situation of Major Roads

Traffic situation of major roads in years 1990, 2000 and 2010 is presented in Table 5.3.3, Figure 5.3.4 and Figure 5.3.5.

The most heavily loaded road is C-4 (EDSA) carrying about 104,000 pcu per day in 1990 which would increase to about 124,000 pcu in 2000 and 141,000 pcu in 2010. The average V/C ratio would be aggravated from 0.9

TABLE 5.3.2 PERFORMANCE OF ROAD NETWORK (WITHOUT EXPRESSWAY) FOR YEAR 1990, 2000 AND 2010

ENTIRE NETWORK

DE-MAND	NETWORK PERFORMANCE	ROAD NETWORK ASSUMPTIONS 1990 (DO NOTHING)		2000 (DO SOMETHING-1)		2010 (DO SOMETHING -2)	
1990	Veh* kms: mil	18.07	100				
	Veh * hrs: mil	0.71	100				
	Ave. trip speed	25.50	100				
	Ave. V/C ratio	0.76	100				
2000	Veh* kms: mil	26.08	144	26.56	146		
	Veh * hrs: mil	1.93	271	1.28	180		
	Ave. trip speed	13.50	53	20.70	81		
	Ave. V/C ratio	1.10	144	0.91	119		
2010	Veh* kms: mil	32.95	182	34.15	188	35.35	195
	Veh * hrs: mil	3.99	561	2.89	407	2.15	302
	Ave. trip speed	8.30	32	11.80	46	16.40	64
	Ave. V/C ratio	1.39	182	1.17	153	0.99	130

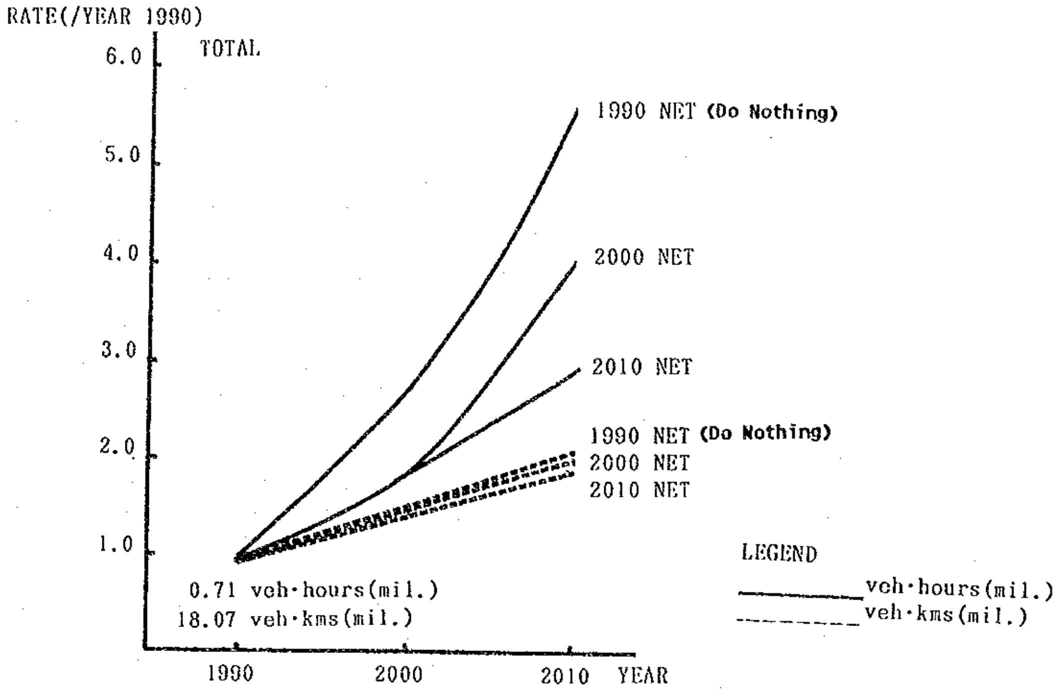
(INSIDE C4)
NETWORK WITHIN EDSA

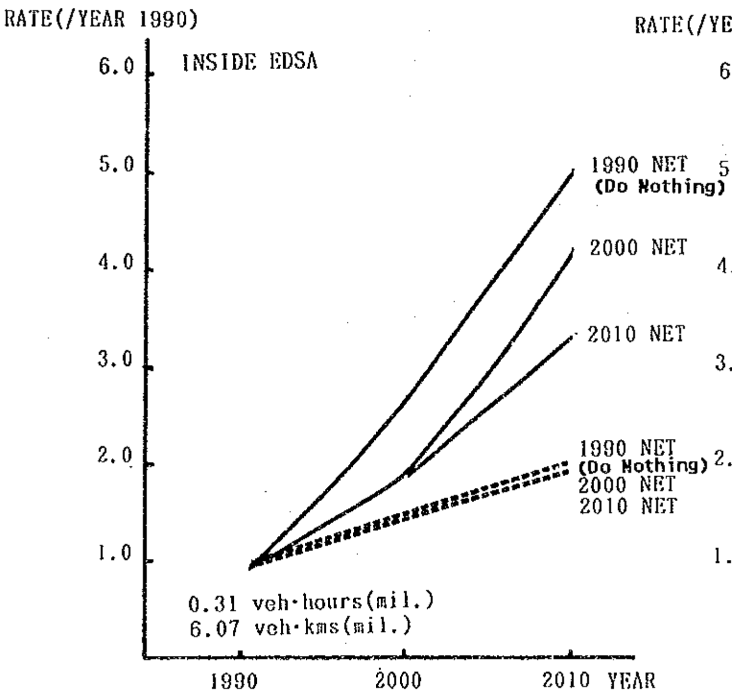
DE-MAND	NETWORK PERFORMANCE	ROAD NETWORK ASSUMPTIONS 1990 (DO NOTHING)		2000 (DO SOMETHING-1)		2010 (DO SOMETHING -2)	
1990	Veh* kms: mil	6.70	100				
	Veh * hrs: mil	0.31	100				
	Ave. trip speed	21.60	100				
	Ave. V/C ratio	0.87	100				
2000	Veh* kms: mil	9.64	143	9.64	143		
	Veh * hrs: mil	0.83	267	0.59	190		
	Ave. trip speed	11.60	53	16.40	75		
	Ave. V/C ratio	1.25	143	1.11	127		
2010	Veh* kms: mil	11.96	178	12.17	181	12.14	181
	Veh * hrs: mil	1.58	509	1.32	425	1.04	335
	Ave. trip speed	7.60	35	9.20	42	11.70	54
	Ave. V/C ratio	1.55	178	1.40	160	1.29	148

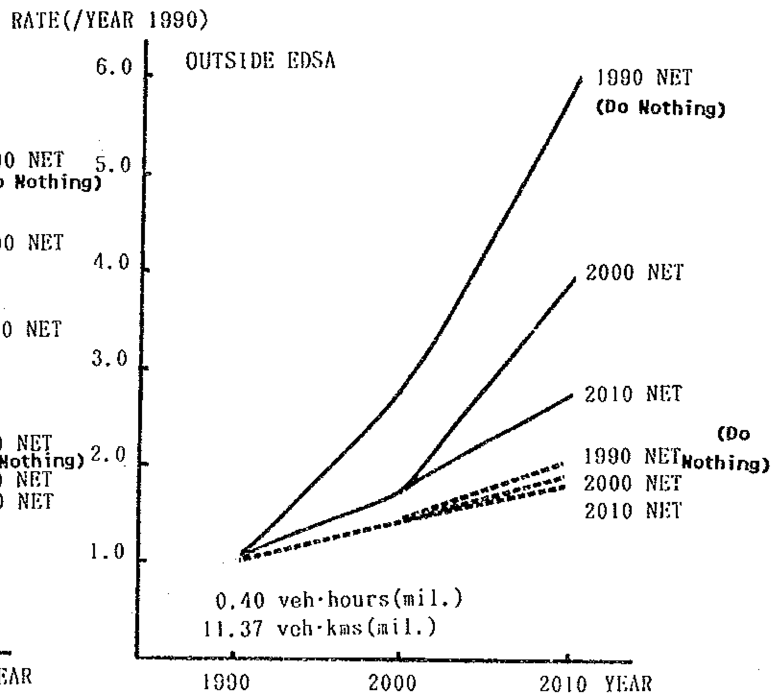
NETWORK OUTSIDE EDSA

DE-MAND	NETWORK PERFORMANCE	ROAD NETWORK ASSUMPTIONS 1990 (DO NOTHING)		2000 (DO SOMETHING-1)		2010 (DO SOMETHING -2)	
1990	Veh * hrs: mil	11.37	100				
	Veh * hrs: mil	0.40	100				
	Ave. trip speed	28.50	100				
	Ave. V/C ratio	0.71	100				
2000	Veh* kms: mil	16.43	144	16.92	148		
	Veh * hrs: mil	1.09	272	0.70	175		
	Ave. trip speed	15.00	52	24.30	85		
	Ave. V/C ratio	1.03	145	0.82	115		
2010	Veh* kms: mil	21.00	184	21.98	193	23.21	204
	Veh * hrs: mil	2.41	602	1.57	392	1.11	277
	Ave. trip speed	8.70	30	14.00	49	20.80	72
	Ave. V/C ratio	1.31	184	1.07	150	0.88	123

FIGURE 5.3.3
ROAD NETWORK PERFORMANCE (WITHOUT EXPRESSWAYS)







in 1990 to 1.2 in 2010 and the average travel speed would decrease from 27 km/hour in 1990 to only 14 km/hour in 2010.

Three (3) radials inside EDSA also carry heavy traffic. These are R-1 (Roxas Blvd.), R-7 (Quezon Ave.), and R-3 (South Super Highway). Traffic on these radial roads would sharply increase and reach to about 130,000 pcu per day in year 2010, and the average V/C ratio and travel speed would be 1.3 to 1.4 and 10 to 13 km/hour in 2010, respectively.

Another radial roads inside EDSA namely R-6 (Aurora Blvd.), R-9 (Rizal Avenue Extension) and R-5 (Shaw Blvd.) carry about 60,000 pcu per day in 1990 which would increase to 70,000 to 80,000 pcu in 2010. These radials are provided with only 4 lanes, therefore, have already reached to their capacity and the average V/C ratio would be 1.3 to 1.5 in 2010. Widening of these roads is practically impossible due to heavy roadside development.

R-8 (A. Bonifacio) and R-2 (Taft Ave.) have also reached to their capacity due to limited number of lanes, though traffic on them is relatively small varying from 37,000 to 47,000 pcu per day in 1990. In 2010, traffic situation on these roads would be further worsened.

Traffic situation of C-1 and C-2 is also critical. They carry about 49,000 to 43,000 pcu per day and their average V/C ratio and travel speed are about 1.4 and 10 to 11 km/hour in 1990, respectively. The average traffic volume on these circumferentials would increase to about 80,000 pcu and the average V/C ratio would be about 1.5 in 2010.

C-3, upon completion by 2010, will surely function as the major traffic distributer road and would carry about 73,000 pcu per day. Traffic on it would exceed its capacity by 1.3 times and the travel speed would be low at about 16 km/hour in year 2010.

C-5 is scheduled to be completed by 2000 and would carry about 41,000 pcu in 2000 and 54,000 pcu in 2010. C-5 would reach to its capacity in 2010.

C-6 will be constructed by 2010. The average traffic volume would be about 39,000 pcu per day.

TABLE 5.3.3 TRAFFIC SITUATION OF MAJOR ROADS FOR YEAR 1990, 2000 AND 2010
(WITHOUT EXPRESSWAYS)

YEAR 1990 (1990 DEMAND, 1990 NETWORK)

	INSIDE EDSA (C4)				OUTSIDE EDSA (C4)			
MAJOR ROAD	LENGTH (KM.)	AVE. TRAFFIC (PCU)	AVE. V/C RATIO	AVE. TRAVEL SPEED (KPH)	LENGTH (KM.)	AVE. TRAFFIC (PCU)	AVE. V/C RATIO	AVE. TRAVEL SPEED (KPH)
R1	8.1	86965	0.90	35.0	7.8	59989	0.59	67.9
R2	6.1	36523	1.02	9.4				
R3	4.5	74185	0.73	67.6	14.5	88098	1.06	44.0
R4								
R5	3.8	58757	1.13	16.8	3.4	18605	1.55	6.3
R6	3.7	61121	1.18	23.5	8.4	26891	0.89	30.6
R7	6.7	83236	0.84	38.1	7.2	73341	0.77	53.5
R8	5.7	46541	0.91	41.6	13.8	38475	0.62	65.4
R9	7.3	59646	1.03	21.0	9.4	32199	0.62	52.7
R10	5.1	22458	1.07	31.4				
Sub-Total	51.0	60432	0.93	26.4	64.5	52708	0.78	44.1
C1	5.7	49114	1.36	10.9				
C2	9.7	43433	1.36	11.3				
C3	8.7	24795	0.68	22.2				
C4					27.2	104449	0.86	27.2
C5								
C6								
Sub-Total	24.1	38037	1.10	12.6	27.2	104449	0.86	27.2
Other Roads	88.2	30686	0.76	22.4	295.8	17923	0.62	23.7
Total	163.2	41059	0.87	21.6	385.5	29475	0.71	28.5

YEAR 2000 (2000 DEMAND, 2000 NETWORK)

	INSIDE EDSA (C4)				OUTSIDE EDSA (C4)			
MAJOR ROAD	LENGTH (KM.)	AVE. TRAFFIC (PCU)	AVE. V/C RATIO	AVE. TRAVEL SPEED (KPH)	LENGTH (KM.)	AVE. TRAFFIC (PCU)	AVE. V/C RATIO	AVE. TRAVEL SPEED (KPH)
R1	8.1	118252	1.20	20.0	7.8	91522	0.90	48.7
R2	6.1	51343	1.24	9.2				
R3	4.5	110774	1.09	41.7	14.5	96790	1.16	28.9
R4								
R5	3.8	60374	1.16	29.5	3.4	20404	1.70	6.8
R6	3.7	71359	1.38	13.3	8.4	31111	1.03	15.0
R7	6.7	112663	1.12	22.7	7.2	88101	0.92	45.0
R8	5.7	62816	1.19	25.5	13.8	62012	0.66	61.2
R9	7.3	74107	1.19	17.6	9.4	37178	0.72	50.7
R10	6.3	23989	0.79	17.5	2.7	19056	0.37	60.0
Sub-Total	52.2	77892	1.15	19.5	67.2	64331	0.88	34.3
C1	5.7	65816	1.40	11.9				
C2	9.7	58250	1.43	9.2				
C3	15.1	46963	0.87	27.1				
C4					27.4	123546	1.02	20
C5					37.1	40725	0.71	30.0
C6								
Sub-Total	30.5	54069	1.11	13.9	64.5	75908	0.90	22.3
Other Roads	88.2	44601	1.06	15.1	316.4	24445	0.75	22.1
Total	170.9	56457	1.11	16.4	447.6	37806	0.82	24.3

YEAR 2010 (2010 DEMAND, 2010 NETWORK)

	INSIDE EDSA (C4)				OUTSIDE EDSA (C4)			
MAJOR ROAD	LENGTH (KM.)	AVE. TRAFFIC (PCU)	AVE. V/C RATIO	AVE. TRAVEL SPEED (KPH)	LENGTH (KM.)	AVE. TRAFFIC (PCU)	AVE. V/C RATIO	AVE. TRAVEL SPEED (KPH)
R1	8.1	137697	1.35	10.0	7.75	98857	0.89	31.5
R2	6.1	76207	1.45	7.9				
R3	4.5	129288	1.28	17.2	14.1	100532	1.21	21.5
R4								
R5	3.8	71083	1.37	14.6	3.4	33006	2.75	5.5
R6	3.7	77794	1.50	7.6	8.4	36456	1.20	15.9
R7	6.7	135118	1.30	12.7	7.2	59495	0.62	54.5
R8	5.7	70529	1.28	14.0	13.8	55557	0.71	37.7
R9	7.3	85962	1.26	12.1	9.4	48798	0.94	40.9
R10	6.3	44860	1.00	12.7	5.9	30749	0.59	50.5
Sub-Total	52.2	94542	1.31	11.4	69.9	63408	0.92	25.7
C1	5.7	81631	1.33	11.2				
C2	9.7	77482	1.47	8.8				
C3	16.1	72700	1.28	15.8				
C4					27.4	140526	1.16	14.4
C5					37.1	54322	0.94	20.1
C6					42.5	39354	0.73	39.9
Sub-Total	31.5	75786	1.35	11.8	107.0	70452	0.97	18.4
Other Roads	88.2	54758	1.24	12.0	372.9	30151	0.81	21.1
Total	171.9	70689	1.29	11.7	549.8	42223	0.88	20.8

FIGURE 5.3.4 AVERAGE TRAFFIC VOLUME ATTRACTED ON MAJOR ROADS

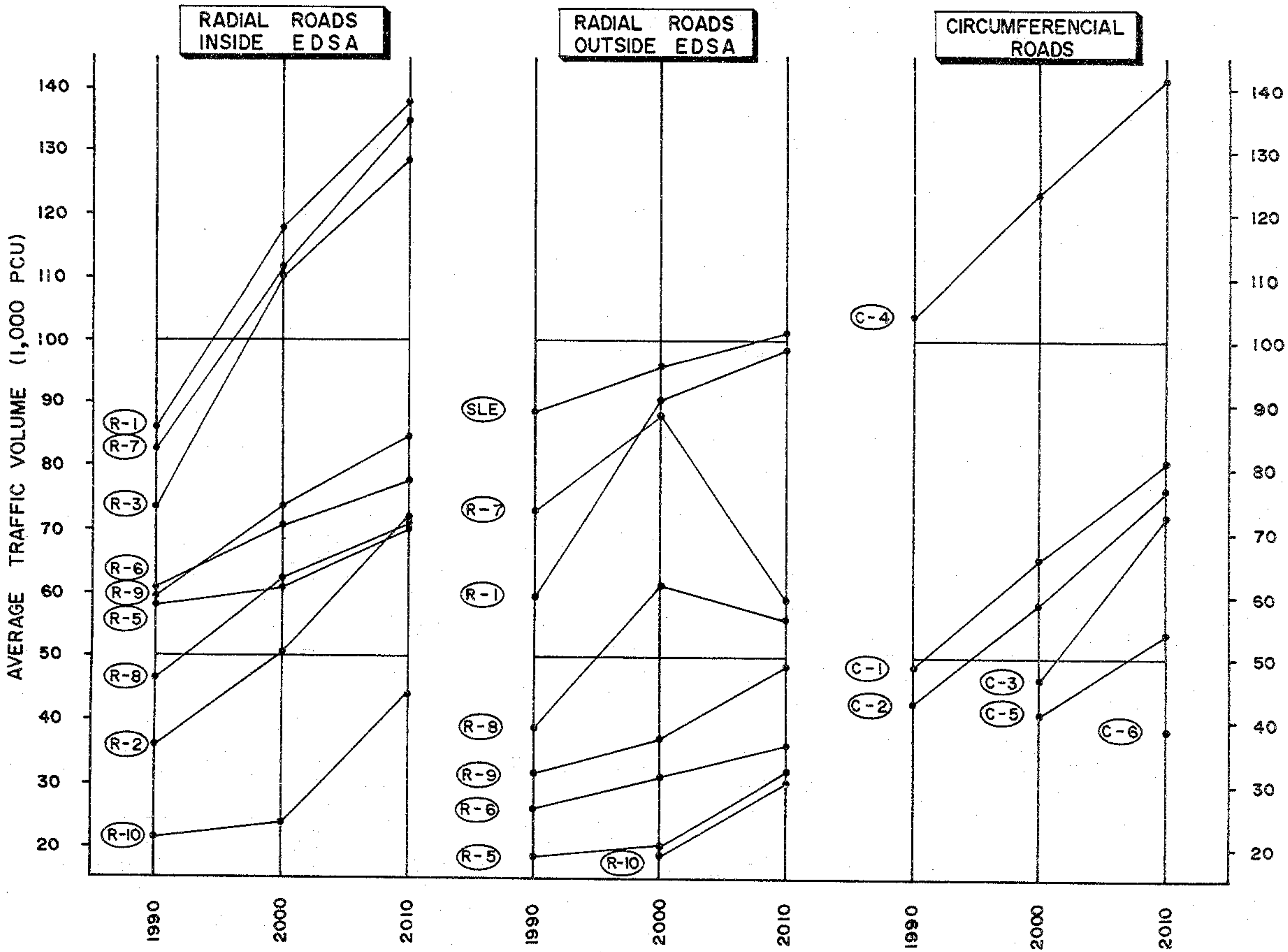


FIGURE 5.3.5
ROAD TRAFFIC DISTRIBUTION ON 1990, 2000 AND 2010 ROAD NETWORK
(WITHOUT EXPRESSWAYS)

4) Supply and Demand Gap

Supply and demand gap of at-grade roads were analyzed by comparing the assigned future traffic volume and road network capacities accross the assumed mini-screenlines (refer to Figure 5.3.2). The results are shown in Table 5.3.4 and summarized as follows:

(a) For 1990, supply capacities exceed demand on most of the miniscreens if traffic management measures are adequately implemented to utilize the roads capacities to maximum extent. Actual situation indicates roads capacities are reduced considerably in many locations due to lack of intersection management, roadside parking, traffic flow control, pavement conditions, driving attitude, etc.

(b) By year 2000, in spite of the completion of on-going/planned roads projects, road capacities will lack in the following areas:

- radials in the northern section of the area between C2 and C4
- radials in the southern and southeastern section of the area outside C4
- circumferentials in all areas

(c) By year 2010, the same situation experienced in year 2000 will continue and the capacity insufficiency be amplified.

TABLE 5.3.4 SUPPLY AND DEMAND GAP OF METRO MANILA ROAD NETWORK FOR YEAR 1990, 2000 AND 2010 (DO NOTHING SITUATION)

YEAR 1990

MINI SCREEEN	SUPPLY			DEMAND [1]			D-S GAP		NO. OF ADDITIONAL LANES[3]
	NO. OF ROADS	NO. OF LANES	PRACTICAL CAPACITY	PRIVATE	PUBLIC	TOTAL	V/C RATIO	C-V (PCU)	
A. Radial									
MS1	7	32	393200	265682	84758	385999	1.0	7201	–
MS2	6	20	173800	71232	30100	103033	0.6	70767	–
MS3	8	32	375200	215991	76356	248560	0.7	126640	–
MS4	6	26	428000	218940	58608	288914	0.7	139086	–
MS5	6	26	383400	199678	87422	301354	0.8	82046	–
MS6	5	16	241900	128382	76012	181180	0.7	60720	–
B. Circumferential									
MS11	3	12	128520	78652	9476	83231	0.7	45289	–
MS12	4	22	276800	235664	52332	236699	0.9	40101	–
MS13	5	20	254160	254147	36722	191005	0.8	63155	–

YEAR 2000

MINI SCREEEN	SUPPLY			DEMAND				D-S GAP		NO. OF ADDITIONAL LANES[3]
	NO. OF ROADS	NO. OF LANES	PRACTICAL CAPACITY	PRIVATE	PUBLIC	TOTAL	ADJUSTED TOTAL [2]	V/C RATIO	C-V (PCU)	
A. Radial										
MS1	7	32	393200	399074	66514	519000	432500	1.1	-39300	2.6
MS2	6	22	249900	125342	34426	162761	156500	0.6	93400	–
MS3	9	36	461600	352655	79716	360879	343694	0.7	117906	–
MS4	6	26	446000	331502	46962	395673	387915	0.9	58085	–
MS5	7	28	441000	308575	91790	422393	398484	0.9	42516	–
MS6	5	16	241900	183949	85430	258904	315737	1.3	-73837	4.9
B. Circumferential										
MS11	3	12	128520	103645	26380	123572	138845	1.1	-10325	0.7
MS12	5	30	429200	422462	59466	389971	410496	1.0	-18704	1.3
MS13	6	24	311760	368651	45878	269672	289970	0.9	21790	1.5

YEAR 2010

MINI SCREEN	SUPPLY			DEMAND				D-S GAP		NO. OF ADDITIONAL LANES
	NO. OF ROADS	NO. OF LANES	PRACTICAL CAPACITY	PRIVATE	PUBLIC	TOTAL	ADJUSTED TOTAL [2]	V/C RATIO	C-V (PCU)	
A. Radial										
MS1	7	34	406400	483337	75508	623535	519613	1.3	-113.213	7.5
MS2	6	22	238800	157615	39390	200769	193047	0.8	45753	–
MS3	10	40	519200	481303	99914	483644	460613	0.9	58587	–
MS4	6	26	470000	410986	53736	486058	476527	1.0	-6527	0.4
MS5	8	32	498600	379406	104690	511180	482245	1.0	16355	–
MS6	6	20	301900	178833	96512	275345	335787	1.1	-33887	2.3
B. Circumferential										
MS11	5	18	203880	161640	38700	190276	213793	1.0	-9913	0.7
MS12	6	34	486800	546181	74092	501386	527775	1.1	-40975	2.7
MS13	6	24	325080	513857	52084	364027	391427	1.2	-66347	4.4

1) Demand: Actual observed traffic volume

2) Demand total is adjusted based on observed traffic volume/assigned traffic volume of 1990 (Refer to Table 5.3.1)

3) No. of additional lanes are calculated based on average per lane capacity of 15,00/day

5.4 AVAILABLE SPACE AND PHYSICAL CONSTRAINTS FOR EXPRESSWAY

1) Available Space for Expressways

DPWH has been encountering serious problems of ROW acquisition and dislocation of squatters which oftenly delay implementation of a project for several years. To avoid such serious problems, expressway routes should be so planned as to utilize existing public spaces to a maximum extent. Public spaces which can be utilized in Metro Manila are:

- Roads
- Rivers
- PNR Right-of-way

Other public spaces such as military camps, government owned lands, etc. can also be utilized.

a) Public Road Spaces

Figure 5.4.1 shows ROW widths of existing roads as well as proposed roads which are scheduled to be completed by year 2010.

Width of space required for an introduction of an elevated expressway is summarized in Table 5.4.1.

TABLE 5.4.1 WIDTH OF SPACE REQUIRED FOR ELEVATED EXPRESSWAY

	REQUIRED SPACE (METERS)	
	NORMAL SECTION	ON/OFF RAMP SECTION
2-way 4-lane Expressway	30.0	36.5 1/
2-way 6-lane Expressway	36.5	43.0 1/
1-way 2-lane Expressway	22.5	31.0 2/
1-way 3-lane Expressway	23.5	34.5 2/

Notes: • Minimum horizontal clearance between an expressway and building line shall be 5 meters
• At-grade street shall have at least 4 lanes
1/ Type of ramp: Center ramp
2/ Type of ramp: Side ramp

When compared required space with existing road ROW width shown in Figure 5.4.1, following facts are obvious:

- Only limited roads can accomodate an expressway, particularly inside C-4, thus this fact will be a major control of an expressway network planning.

- One-way expressway or double-deck type of expressway will have to be planned, as ROW width of one road is mostly inconsistent.

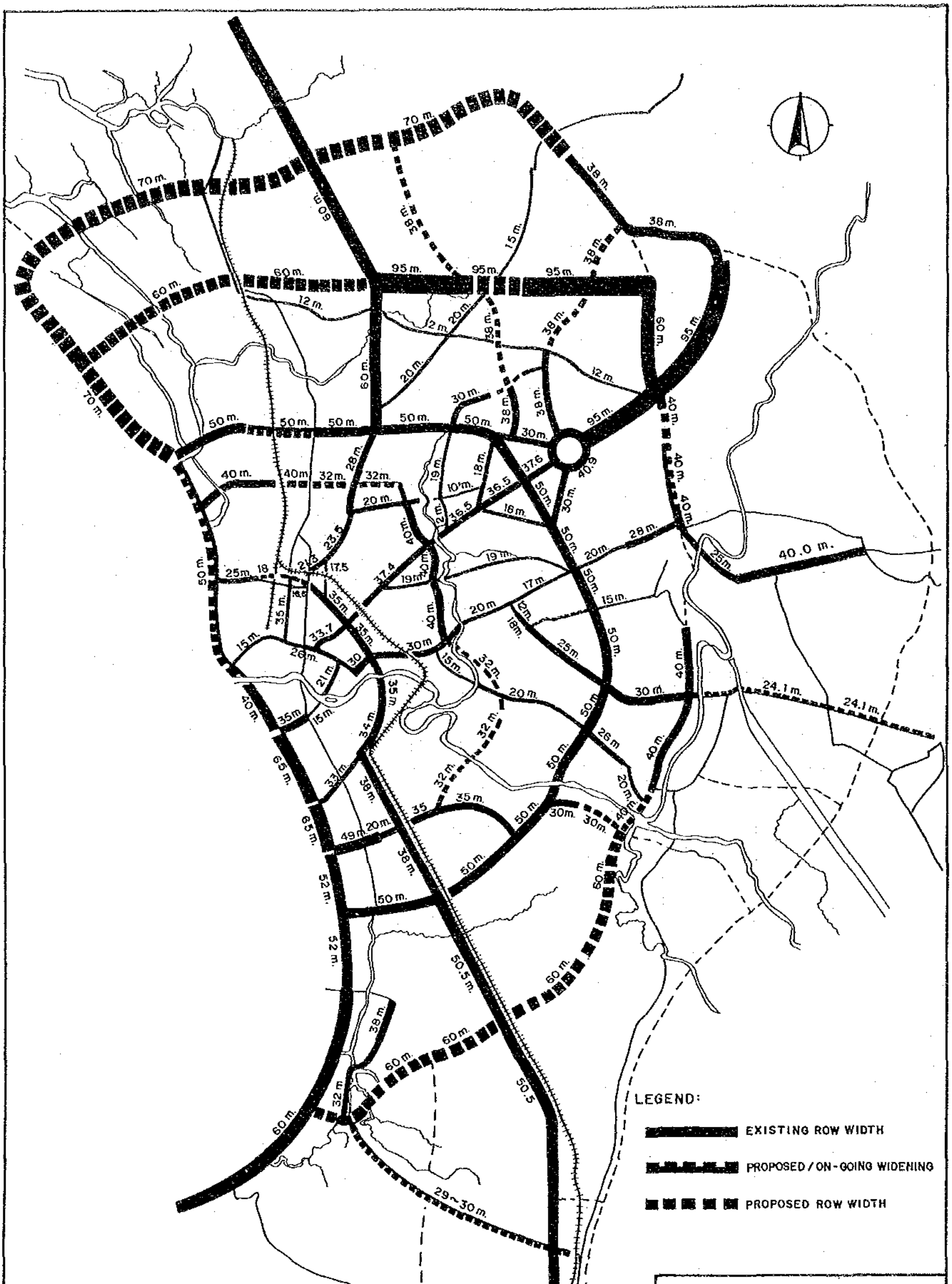


FIGURE: 5.4.1
EXISTING / PROPOSED
ROW WIDTH OF
ARTERIAL STREET

b) Rivers

Rivers over which expressways can be constructed are shown in Figure 5.4.2. To be considered for utilizing river spaces are as follows:

- Either private facilities such as factories, warehouses and residential houses or squatters occupy up to the edge of river banks.

- When substructures of an expressway are required to be built within river waterway, necessary hydraulic analysis and environmental assessment must be undertaken.

c) PNR ROW

PNR has mostly wide ROW of 30 meters as shown in Figure 5.4.3.

2) Physical Constraints

Major physical constraints for an expressway network planning are existing and proposed interchanges and LRT lines. Figure 5.4.3 presents existing and committed interchanges. LRT lines are shown in Figure 5.2.2.

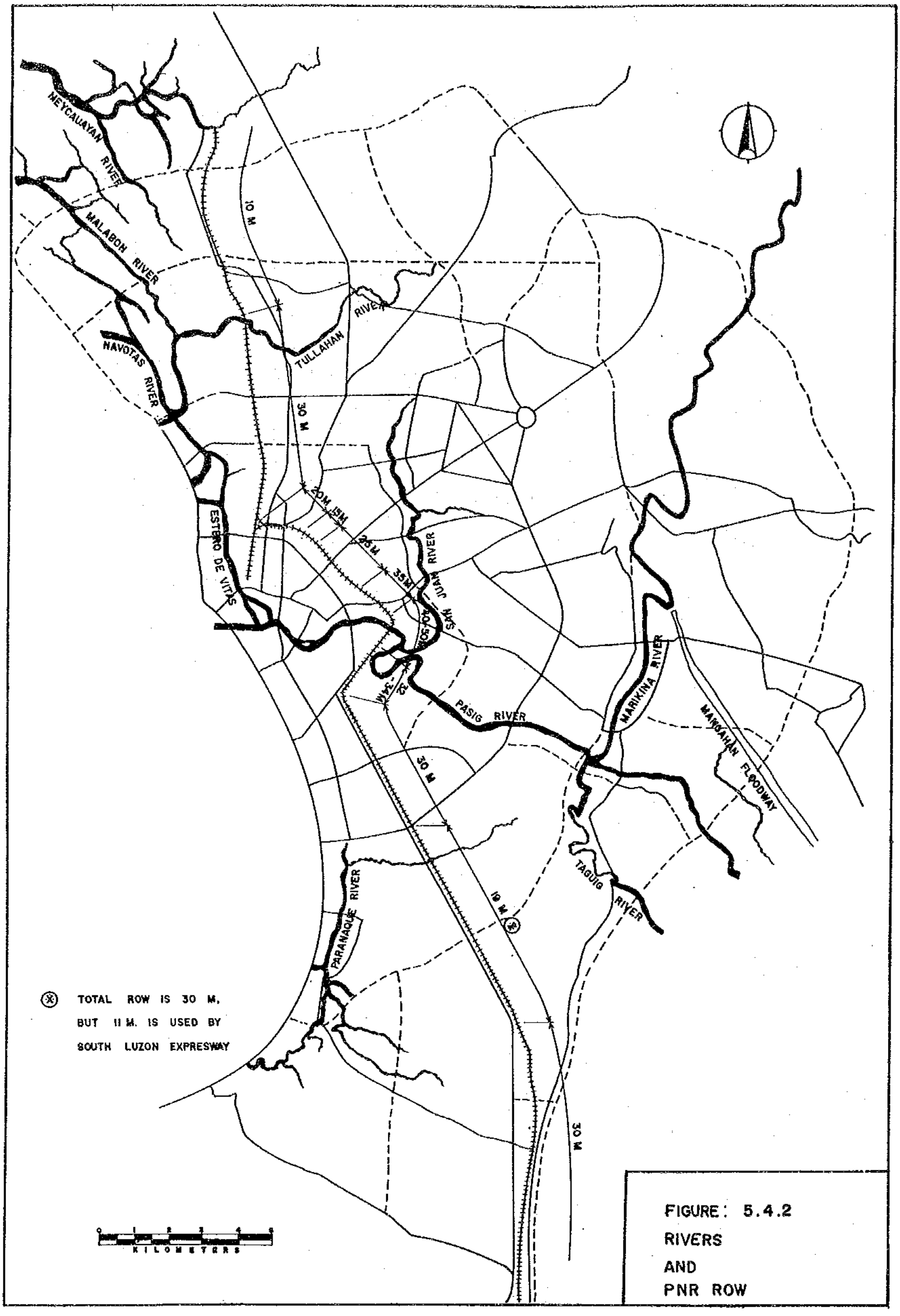


FIGURE: 5.4.2
RIVERS
AND
PNR ROW

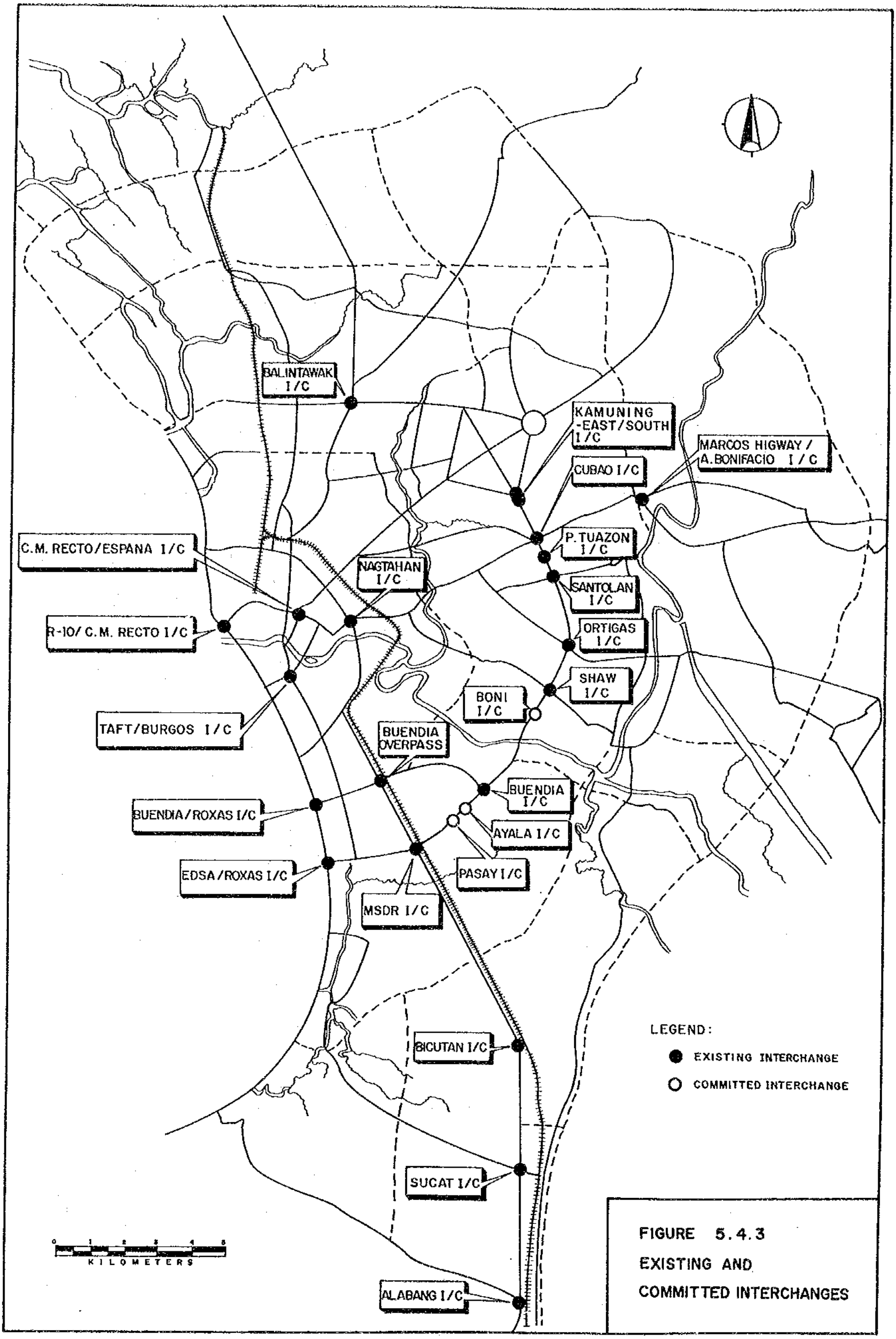


FIGURE 5.4.3
EXISTING AND
COMMITTED INTERCHANGES

5.5 CANDIDATE EXPRESSWAY CORRIDORS

Candidate expressway corridors were selected in due consideration of the following:

- Available public space
- Traffic demand distribution pattern
- Locations of CBDs and satellite urban centers
- Urban development directions
- Connection with future inter-city expressways

Candidate expressway corridors are shown in Figure 5.5.1.

1) Candidate Expressway Corridors in Circumferential Direction

Selected for candidate expressway corridors were as follows:

a) C-2 Corridor (Along C-2)

C-2 is strategically located to distribute traffic to/from Manila CBD onto radial roads. An expressway along this corridor will greatly strengthen accessibility to Manila CBD.

Existing C-2 has ROW of 33.0 to 36.6 meters from R-1 to Andalucia, however, section from Andalucia to Juan Luna has narrow ROW of 16.5 meters where ROW acquisition is quite difficult due to commercial development. Section from Juan Luna to R-10 will have ROW of 50 meters.

An alternate alignment is to utilize PNR ROW from Paco Station to PNR Northline.

b) C-3 Corridor (Along C-3)

An expressway along C-3 will greatly contribute to alleviate traffic congestion of C-4.

At-grade C-3 is not completed yet. Sections from A. Mabini St. to Rizal Ave. Extension and from San Juan River to Buendia Ave. are scheduled to be completed by 2000 and 2010, respectively, due to difficult ROW acquisition and squatters dislocation.

At-grade C-3 has and will have ROW of 32 to 40 meters, except section from South Super Highway to Tramo Ave. of which ROW is 20 meters and widening is practically impossible due to 5 to 10 stories permanent buildings.

An alternative alignment is to utilize San Juan River.

c) C-4 Corridor (Along C-4)

An expressway along C-4 will directly connect Makati and Ortigas CBDs and other urban centers.

Although at-grade C-4 has 50-meter ROW, interchanges were built and LRT Line-3 will be built at the center median portion occupying 8 to 9 meters in width, thus introduction of an expressway along this corridor is physically difficult.

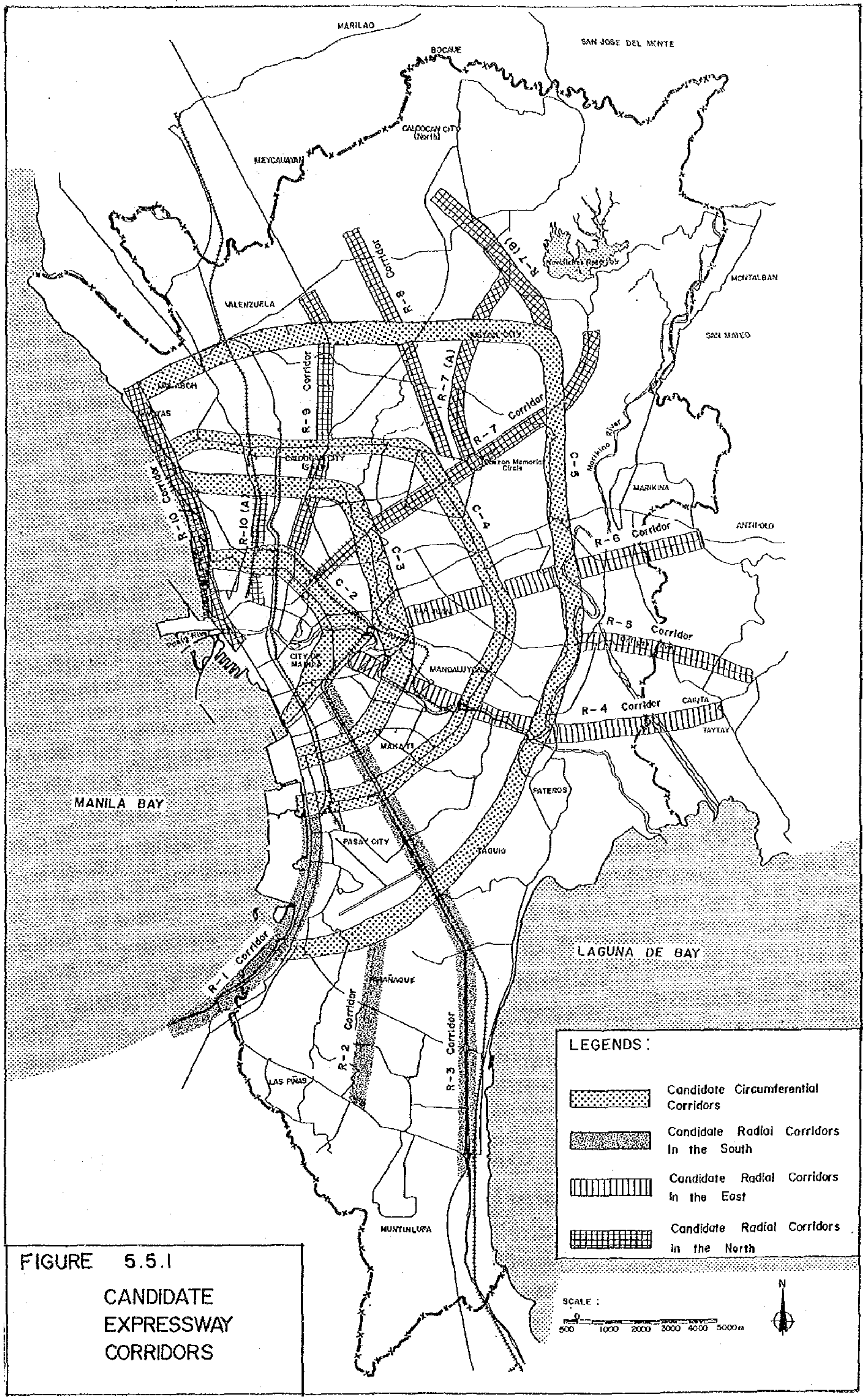


FIGURE 5.5.1

CANDIDATE EXPRESSWAY CORRIDORS

Physical possibility of introduction of an expressway along this corridor was studied as presented in Appendix 5.5.1. Recommended solution is to construct an expressway and LRT Line 3 as one integrated structure utilizing the space provided for LRT Line 3. This solution requires close coordination between DPWH and DOTC.

d) C-5 Corridor (Along C-5)

An expressway along this corridor will provide access to outer fringe of Makati/Ortigas CBDs and other urban centers, and contribute greatly to reduce traffic burden of C-4. An expressway can also function as north-south transport axis in the overall transport network.

At-grade C-5 has and will have wide ROW ranging from 40 meters to 95 meters. An at-grade expressway can be accomodated for these sections which have more than 60-meter ROW.

A corridor along C-1 cannot be a candidate for an expressway corridor due to the following reasons:

- Its length is too short to provide interchanges with radial expressways as well as to provide on/off ramps, therefore, it will not function efficiently as a distributor link.
- Most of C-1 sections have narrow ROW ranging from 15 meters to 26 meters, a 4-lane expressway cannot be accomodated unless additional ROW is acquired. Additional ROW acquisition is practically impossible due to heavy commercial development.

A corridor along C-6 is considered separately, because PNCC has been given the franchise for Metro Manila Tollway which passes through along this corridor.

2) Candidate Expressway Corridors in Radial Direction

Radial expressway corridors were studied by dividing areas into three, i.e. the south, the east and the north.

a) Radial Expressway Corridors in the South

The southern area is growing rapidly, however, there are only two major road in the radial direction, one is R-1 Extension which passes along Manila Bay coastal line and the other South Luzon Expressway along Laguna de Bay. Two major roads are 5 to 10-km apart each other. There is an urgent need to construct one more radial in between existing two major roads.

Three candidate corridors are selected in the south as follows:

(a) R-1 Corridor (Existing R-1 Extension)

Existing R-1 Extension is partially access controlled road and will be converted to a toll road. Existing R-1 Extension is included as one link of an expressway system.

(b) R-2 Corridor (Completely New Link)

To serve growing traffic in the direction of north-south and to guide sound development of southern area, R-2 corridor is selected in betwen existing R-1 extension and South Luzon Expressway.

(c) R-3 Corridor (along South Luzon Expressway and South Super Highway)

This is one of the most heavily congested corridors. SLE has 50.5 meter ROW including service roads and SSH has 38 meter ROW. Right-of-way of PNR which runs besides SSH and SLE from Quirino Ave. (C-2) to Bicutan Interchange can also be utilized for an expressway.

b) Radial Expressway Corridors in the East

The eastern area is also growing rapidly, although MMA's policy is to discourage development in the Laguna de Bay area.

Three candidate corridors are as follows:

(a) R-4 Corridor (Along Pasig River and Shaw Blvd. Extension)

An expressway will be planned along Pasig River between C-2 and C-5 which will provide important access to Makati CBD through a short branch line along C-3. An expressway outside C-5 will utilize a proposed Shaw Blvd. Extension ROW.

(b) R-5 Corridor (Along Ortigas Ave. Extension)

Ortigas Ave. Extension is a vital link serving traffic between the East Area and Manila/Makati/Ortigas CBDs.

Ortigas Ave. Extension is being widened to 24.1 meters which can accommodate only a double deck type of an expressway.

Due to the existing EDSA/Ortigas Interchange, construction of an expressway inside C-5 is quite difficult along this corridor. Thus, an expressway will be planned outside C-5 along this corridor.

(c) R-6 Corridor (Along Santolan Road and Marcos Highway)

The area inside C-5 between Pasig River and Quezon Avenue has 3 existing at-grade major roads, namely Shaw Blvd., Ortigas Ave. and Aurora Blvd., all of which merge into R. Magsaysay Blvd., and are heavily congested. They have narrow ROW of 17.0 to 20 meters of which widening is practically impossible due to heavy roadside development, thus an expressway cannot be accomodated. Thus, there is strong need to provide another transport axis in the said area. Introduction of an expressway in the said area is one of the effective solutions.

One candidate corridor is along Santolan Road which has narrow ROW of 15 to 20 meters. Santolan Road passes beside Camp Aguinaldo and Camp Crame, therefore, its widening will be relatively easier.

Section outside C-5 will utilize 40-meter ROW of Marcos Highway.

In the future, an inter-city expressway extending toward the east can be connected with this route.

c) Radial Expressway Corridors in the North

The north-east area between Aurora Blvd. and North Luzon Expressway is one of major private trip generating sources. The northwest area between North Luzon Expressway and Manila Bay is rather underdeveloped.

Six candidate expressway corridors were selected.

(a) R-7 Corridor (along España, Quezon Avenue and Commonwealth Ave.)

España and Quezon Ave. serve traffic between Quezon City and Manila CBD and are heavily congested. Both roads have wide ROW of 36.5 to 37.5 meters. Most sections of Quezon Ave. have wide setback of about 10 meters on both sides.

LRT Line-2 is planned to be built along España.

Commonwealth Ave. has 95-meter ROW and at-grade expressway can be accommodated.

(b) R-7 (A) (Along Visayas Ave.) or R-7 (B) (Along Fair View Ave.)

To collect traffic generated in the northern area of Quezon City, either Visayas Ave. or Fair View Ave. will be utilized, both of which have 38-meter ROW.

(c) R-8 Corridor (Along Mindanao Ave.)

When another inter-city expressway in addition to North Luzon Expressway is needed, this corridor will be the good candidate to be connected.

Mindanao Ave. will have 38-meter ROW.

(d) R-9 Corridor (Along A. Bonifacio and North Luzon Expressway)

North Luzon Expressway and South Luzon Expressway will be connected via Expressway routes C-2 or C-3 to form North-South transport axis.

Section from Blumentritt to Del Monte Ave. of A. Bonifacio has narrow ROW of 23.5 meters, thus a double deck type of structure is required. Section from Del Monte Ave. to EDSA has 28-meter ROW.

North Luzon Expressway has 60-meter ROW, thus 4 more lanes can be added to existing 4 lanes (partially 5 lanes composing of 3 lanes for Manila bound and 2 lanes for north bound).

(e) R-10 Corridor (Along R-10)

An expressway along this corridor provides direct access to Manila International Port.

At-grade R-10 has 50-meter ROW, though one half of most sections are occupied by squatters.

(f) R-10'(A) Corridor (Along Abad Santos and PNR North Line)

To provide direct access to the northern area of Manila CBD, this corridor is selected.

Abad Santos has 35-meter ROW and is connected with C-2 and C-1 (C.M. Recto).

PNR North Line right-of-way will have to be utilized. Squatters occupy areas besides railway tracks.

5.6 ANALYSIS OF MAXIMUM EXPRESSWAY NETWORK

Prior to preparation of alternative expressway network plans, the "Do Maximum Expressway Network" was prepared and assessed with consideration of the following:

"Do Maximum Expressway Network" plan is composed of all potential expressways identified based on the analysis of traffic demand, physical constraints, urban development features so on. Assessment of Do Maximum Plan gives useful information on the traffic level by expressway routes, thus provide an important basis for preparing alternative plans.

The impact of some critical factors such as toll level and time value of private transport user was analyzed on the basis of Do Maximum plan.

Traffic Impact under "Do Maximum" Network

"Do Maximum" expressway network is outlined in Figure 5.6.1, clearly showing the radial and circumferential pattern. This is due partly to the availability of construction space of expressways and partly to the current demand which distributes in such a way that it matches the radial-circumferential pattern of existing at-grade major roads.

Assuming that this is the maximum possible expressways, the estimated traffic demand for year 2010 was assigned [1/] on the network. In the traffic assignment exercise, the following assumptions were made:

- Toll: free, P10, P20, and P30 flat
- Time value of private transport: P0.5, P1.0, and P1.5/minute/pcu

The results of the traffic assignment are summarized in Table 5.6.1 and as follows:

(a) If no toll is charged, approximately 1 million pcu will use the expressways in year 2010, which is approximately 30% of the total private transport demand of year 2010. This will reduce the total vehicle hours of at-grade roads to about a half and that of the entire network by 37%.

(b) The number of expressway users varies considerably by assumed level of toll and time value of users. Although it is generally seen that higher toll reduces the number of users, the reduction is more significant when perceived time value of users is low. If time value of P1.5/min/pcu is assumed, the number of expressway users will be 613 thousand for the P10 toll and which decreases to just about 404 thousand even if toll increases to P30. On the other hand, under the time value of P0.5/min/pcu, the number of users will decrease from 404 thousand to only about 162 thousand when toll charges increase from P10 to P30. Demand elasticity to toll level is more significant in the market with low time value. [2/]

1/ In this exercise, public transport was preloaded on the at-grade roads and it was assumed that all expressways are dual two-lanes.

2/ Time value estimated by UTDP for car is P30/hr and P45/hr per year 1990 and 2010, respectively

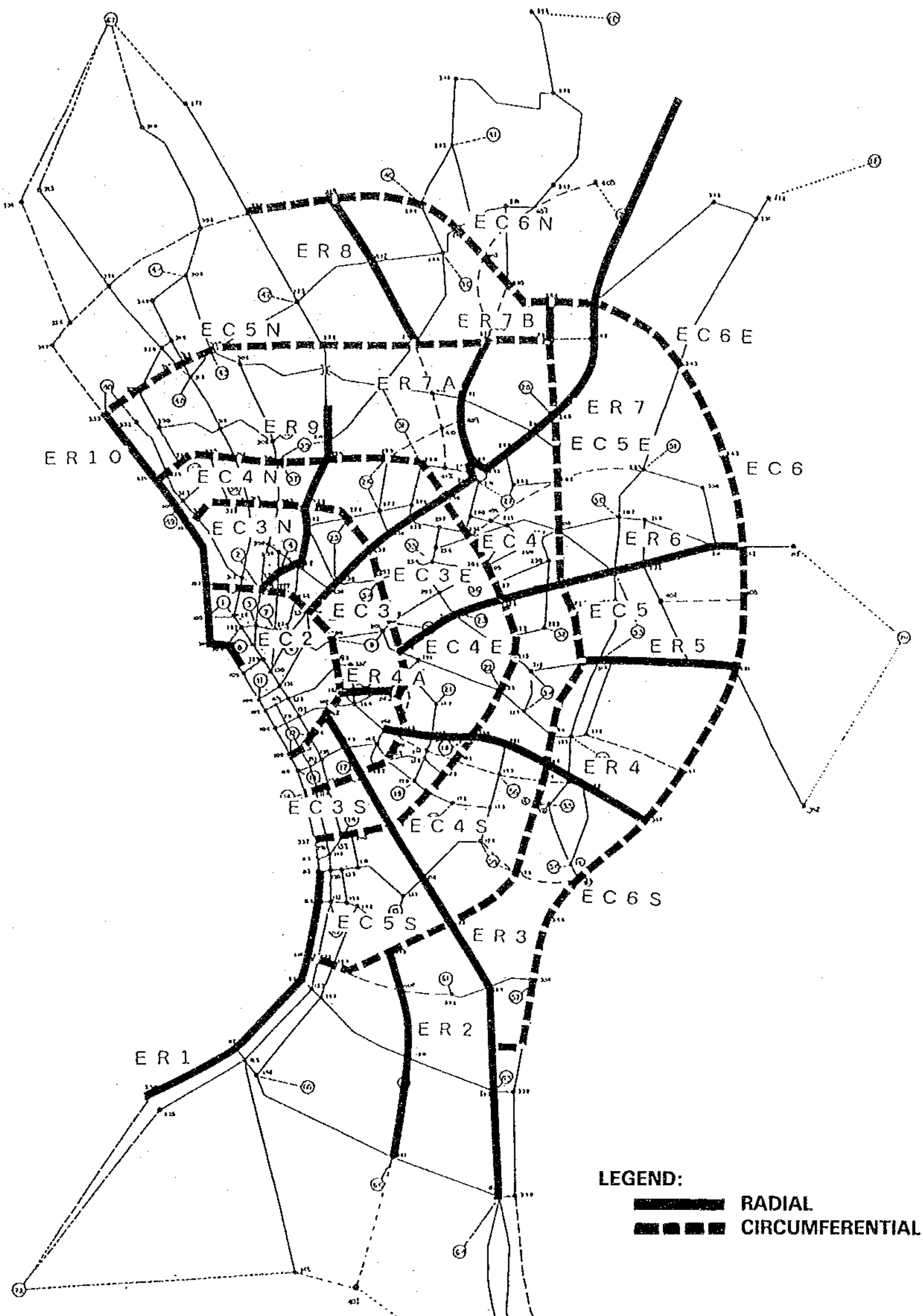
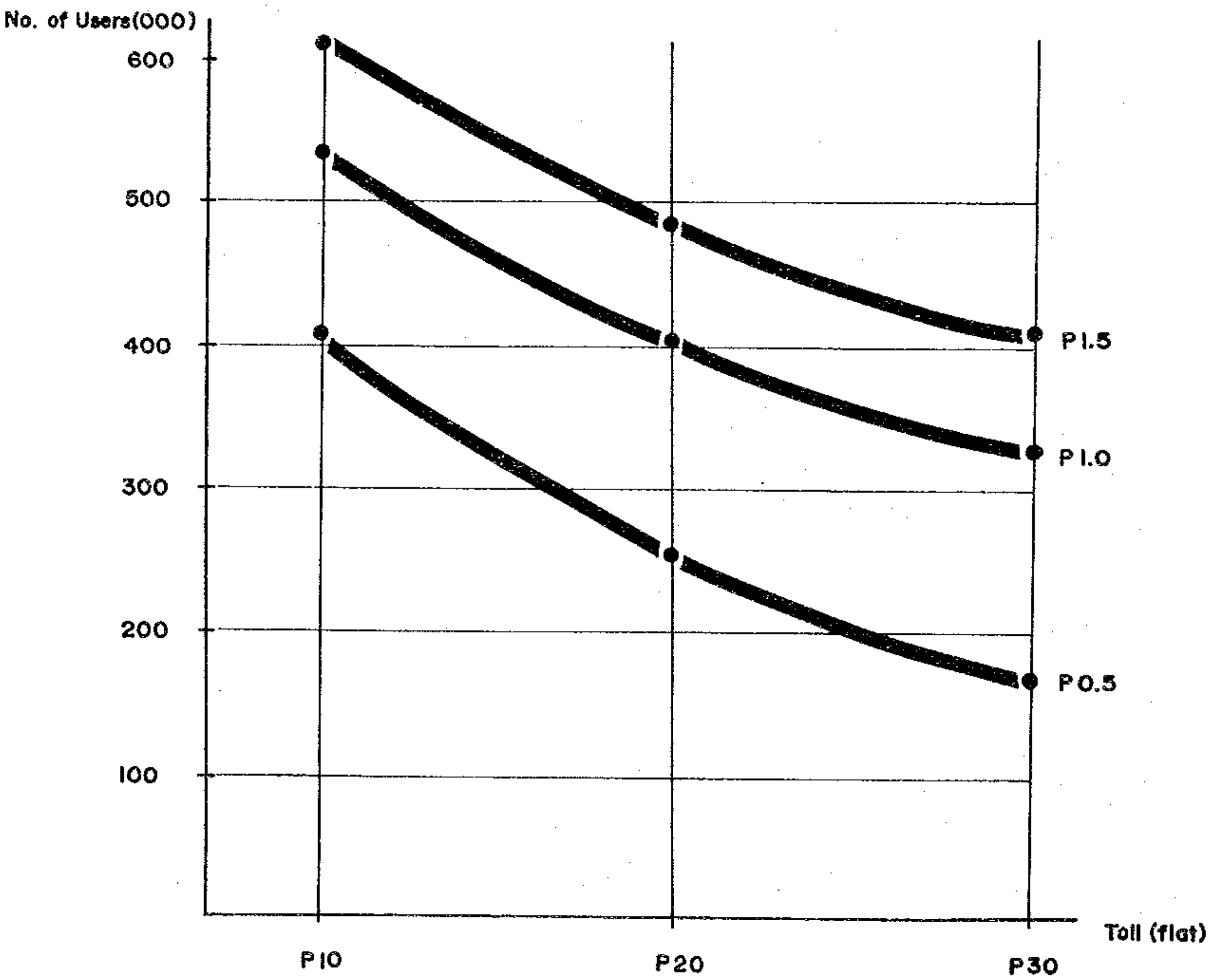


Figure 5.6.1
"DO MAXIMUM" Expressway Network

TABLE 5.6.1 TRAFFIC ASSIGNMENT RESULTS FOR "DO MAXIMUM" NETWORK

CASES		EXPRESSWAYS			OTHER ROADS				ENTIRE NETWORK			
TIME VALUE (P/MIN/PCU)	TOLL (FLAT)	USERS (NO.)	SPEED (KPH)	V/C RATIO	VEH-KM (MILLION)	VEH-HR (MILLION)	SPEED (KPH)	V/C RATIO	VEH-KM (MILLION)	VEH-HR (MILLION)	SPEED (KPH)	V/C RATIO
Do Nothing (No Expressways)		–	–	–	35.35	2.15	16.4	0.99	35.35	2.15	16.4	0.99
–	P 0	988766	40.6	0.71	26.21	1.11	23.7	0.86	36.14	1.35	26.8	0.81
P0.5	P10	403580	49.7	0.48	29.29	1.59	18.4	0.96	35.97	1.73	20.8	0.81
	P20	251829	64.7	0.35	30.94	2.07	14.9	1.02	35.76	2.15	16.7	0.81
	P30	161641	71.2	0.24	32.08	2.45	13.1	1.05	35.46	2.50	14.2	0.80
P1.0	P10	529770	46.5	0.57	28.16	1.35	20.9	0.93	36.08	1.52	23.7	0.81
	P20	402647	49.9	0.48	29.26	1.60	18.3	0.96	35.99	1.74	20.7	0.81
	P30	321040	58.1	0.41	30.18	1.82	16.6	0.99	35.91	1.92	18.7	0.81
P1.5	P10	613184	44.7	0.60	27.65	1.26	21.9	0.91	36.06	1.45	24.9	0.81
	P20	479570	47.4	0.53	28.64	1.44	19.9	0.94	36.08	1.59	22.7	0.81
	P30	403612	50.0	0.48	29.28	1.58	18.5	0.96	35.99	1.72	20.9	0.81

Figure 5.6.2
No. of Expressway Users by Assumed Level of Toll and Time Value



(c) Construction of expressways do not always contribute to the increase in efficiency of the entire road system of Metro Manila. As is typically seen in the cases of traffic assignment results for assumed toll of P20 and P30 under time value of P0.5/min/pcu, the total vehicle hours do not decrease. This is because the decrease in vehicle-hours (or congestion) on at-grade roads due to the diversion of some traffic to the expressways is smaller than the increase in vehicle-hours on at-grade roads due to reduced road capacities by expressway structures. [3/] Accordingly, from the economic viewpoint, the reduction of at-grade road capacities due to expressway construction should be duly taken into account.

The results of the traffic assignments for year 2010 under "Do Maximum" case at assumed toll of P20 flat are shown in Figure 5.6.3 and Figure 5.6.4 for expressways and at-grade roads, respectively. Relatively heavy patronage on expressways is seen along a number of radials (R2, R4, R6, R7 and R9) and circumferentials (C2, C3, C4 and C5). Many sections of those expressways carry 60 thousand to 80 thousand pcu a day. Even with the maximum development of expressways, traffic volume on the at-grade roads is large along many major roads, especially EDSA, Roxas Boulevard, Quezon Avenue etc. On the other hand, C-5 and southern portion of R2 will be less utilized due to the fact that these sections are used more by users with longer trips thus encouraged to be diverted to expressways.

3/ It is tested that under the situation of P20 toll and P1.0 time value, if at-grade roads capacity is reduced by more than 30% due to expressway construction, no benefits from time savings will be generated.

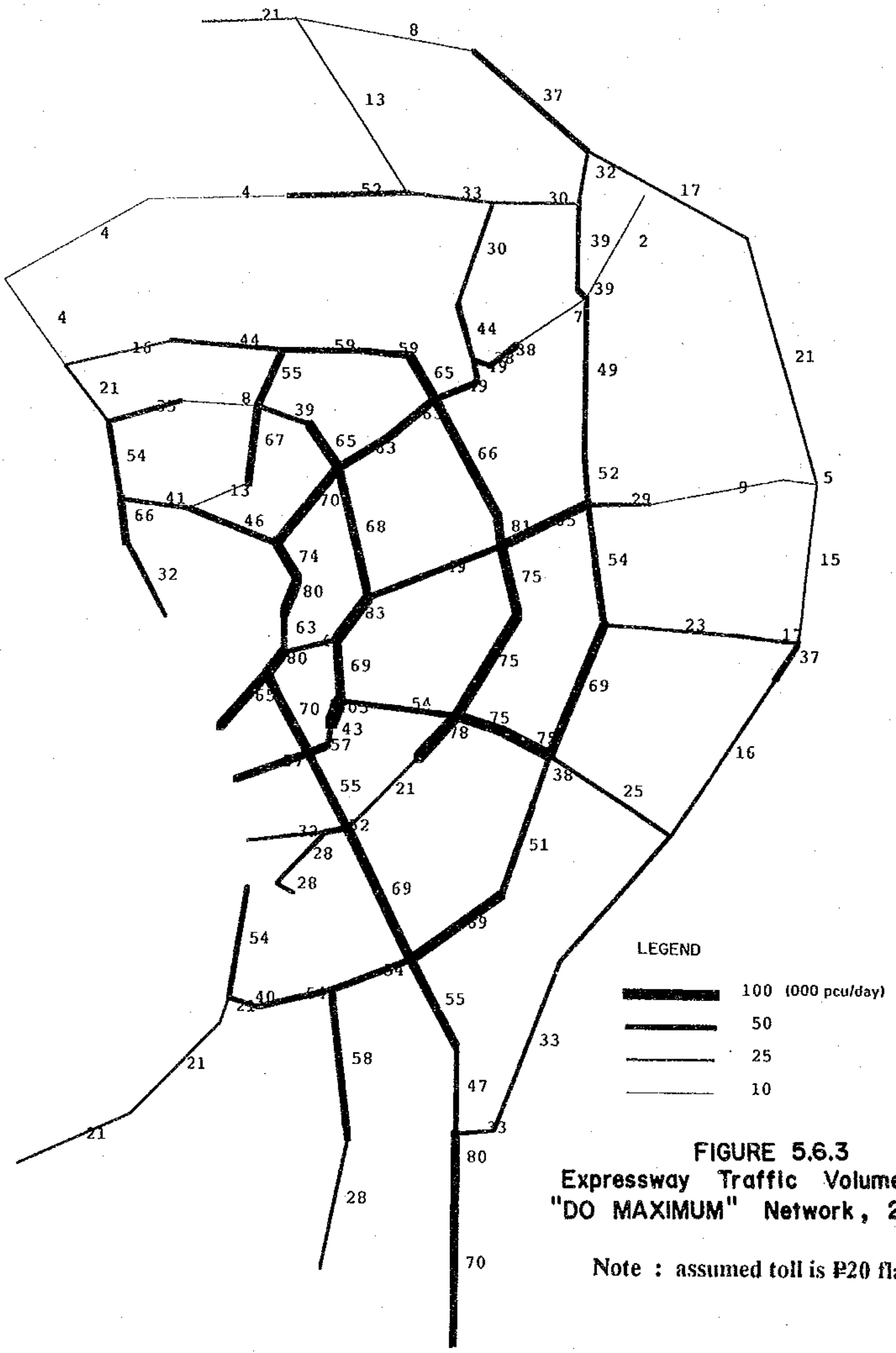


FIGURE 5.6.3
Expressway Traffic Volume on "DO MAXIMUM" Network, 2010

Note : assumed toll is ₱20 flat

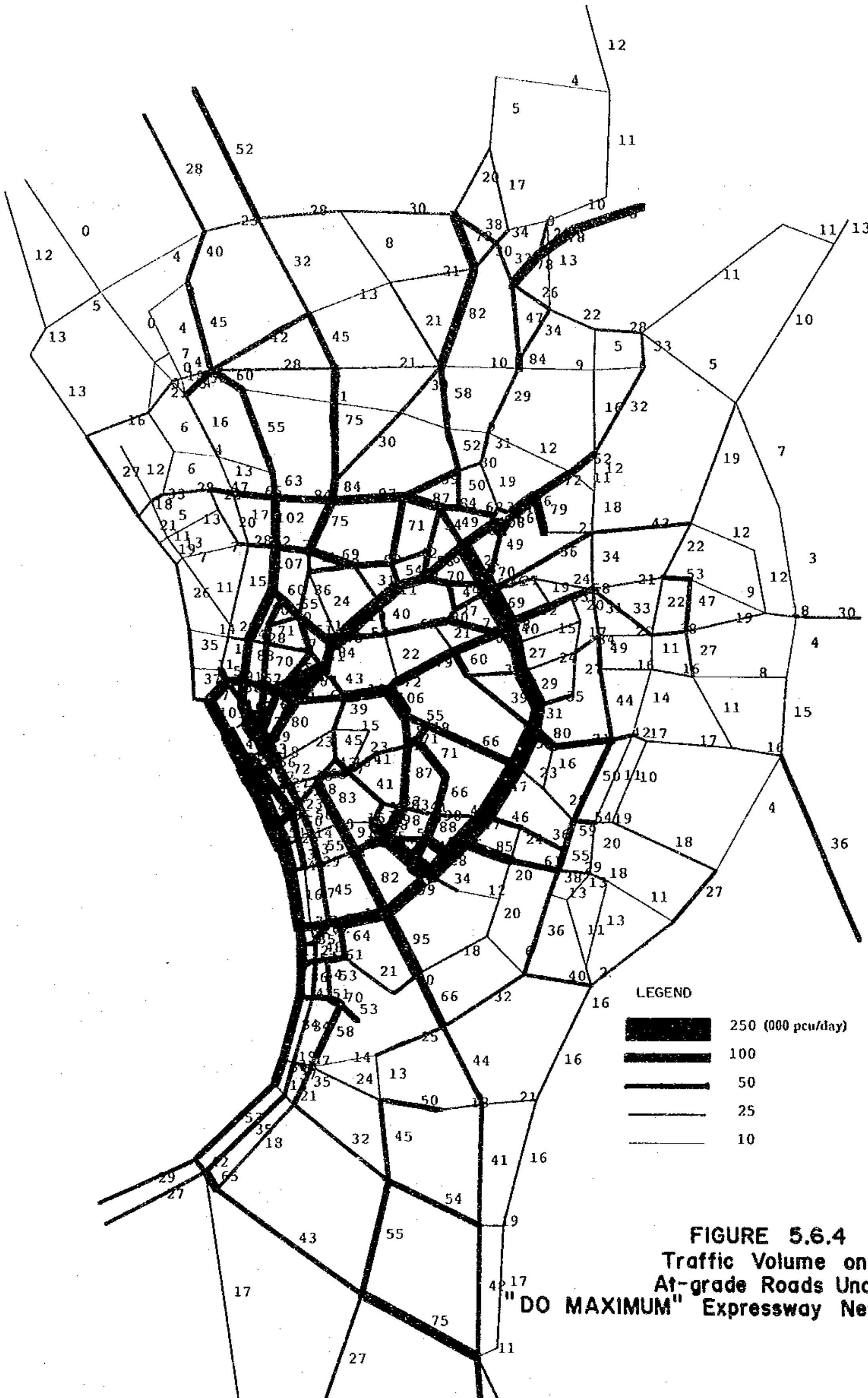


FIGURE 5.6.4
Traffic Volume on At-grade Roads Under "DO MAXIMUM" Expressway Network, 2010